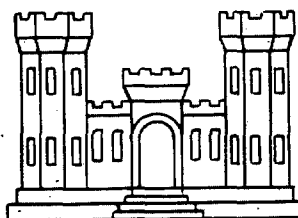


MERRIMACK VALLEY FLOOD CONTROL

DRAFT SPECIFICATIONS
FOR
BENNINGTON DAM

BENNINGTON
NEW HAMPSHIRE

1946



CORPS OF ENGINEERS, U.S. ARMY.

U.S. ENGINEER OFFICE

BOSTON, MASS.

MERRIMACK VALLEY FLOOD CONTROL

DRAFT SPECIFICATIONS

FOR

BENNINGTON DAM

BENNINGTON
NEW HAMPSHIRE

1946

CORPS OF ENGINEERS, U. S. ARMY

U. S. ENGINEER OFFICE

BOSTON, MASS.

Bid No. _____ Bidder _____
(Do not write above this line)

Serial No. 19-023-47-

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

WAR DEPARTMENT
UNITED STATES ENGINEER OFFICE
3rd Floor, Park Square Building
Boston 16, Mass.

(Date) _____

Project: Construction of Bennington Dam
Bennington, New Hampshire

1. Sealed bids in duplicate will be received until 11:00 A.M., Eastern Standard Time, _____ 194 , and then publicly opened, for furnishing all plant, labor, materials and equipment and performing all work for the above-described project in strict accordance with the specifications, schedules, drawings and addenda as follows:

Specifications Entitled: - "Construction of Bennington Dam, Bennington, N. H." and Drawings listed in paragraph SC-2 thereof.

2. Bids will be submitted in sealed envelopes upon the attached Government form of bid, and marked in the upper left hand corner "Bid under Serial No. 19-023-47- to be opened at 11:00 A.M., E.S.T.,

, Attention: Chief, Contracts and Procurement Branch", the serial number indicating the project for which the bid is submitted. The bidder who is awarded the contract will be required to execute the War Department contract form for construction (W.D. Contract Form No. 2), one copy of which accompanies each set of bidding papers.

3. The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any or all items of any bid, unless the bidder qualifies such bid by specific limitation.

4. Bid bond on U. S. Standard Form No. 24 in a penal sum of not less than 20% of the bid price will be required with each bid if the bid price is in excess of \$ 2000.00.

5. Bidders shall carefully examine the drawings and specifications, visit the site of the work, and fully inform themselves as to all conditions and matters which can in any way affect the work or the cost thereof. Should a bidder find discrepancies in, or omissions from, the drawings, specifications or other documents, or should he be in doubt as to their meaning, he should at once notify the Contracting Officer and obtain clarification prior to submitting any bid.

6. Each bidder shall enclose with his bid a statement of whether he is now or ever has been engaged in any work similar to that covered by the specifications herein, the year in which such work was performed and the manner of its execution, and giving such other information as will tend to show the bidder's ability to prosecute the required work.

7. The bidder shall state in his bid that he has available or under his control plant of the character and in the amount required to complete the proposed work within the specified time. Each bidder shall, upon request by the contracting officer, furnish a list of the plant proposed for use on the work.

8. Where sets of the drawings are requested by bona fide bidders a maximum of 3 sets will be furnished any one bidder. A deposit of

\$10.00 will be required to insure their return. The deposit should be in the form of a United States money order or a certified check made payable to "The Disbursing Officer, U. S. Engineer Office, Boston, Massachusetts".

9. Modification prior to date set for opening bids. - The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an addendum or addenda to this Invitation for Bids. Copies of such addenda as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the District Engineer will enable bidders to revise their bids. In such case, the addendum will include an announcement of the new date for opening bids.

10. Liquidated damages for delay will be assessed in the sum fixed in the specifications.

Bid No.

Serial No. 19-023-47

B I D
(CONSTRUCTION CONTRACT)

Date:

To: U. S. Engineer Office
31 St. James Avenue
Boston 16, Mass.

Project: Construction of Bennington Dam
Bennington, New Hampshire

In compliance with your Invitation for Bids dated _____
the undersigned hereby proposes to furnish the plant, labor, materials
and equipment and perform all work for the above-described project in
strict accordance with the specifications, schedules, drawings listed
in paragraph SC-2 and addenda numbered

_____, for the
(Addenda Numbers to be inserted by Bidder)

Construction of Bennington Dam, Bennington, New Hampshire, for the
consideration of the unit prices set forth in attached schedule,
Engineer Form No. 1618, and agrees, upon receipt of written notice of
an award of the contract within 30 days after the date of opening of
the bids, that he will execute W.D. Contract Form No. 2, in accordance
with this bid as accepted; and if the consideration of the contract
will exceed \$2,000 in amount will furnish to the Government a perform-
ance bond on U. S. Standard Form No. 25 or U. S. Standard Form No. 25-B
and a payment bond on U. S. Standard Form No. 25-A or U. S. Standard

Form No. 25-C with good and sufficient surety or sureties, as required by the specifications, at the time that the contract is executed.

The bidder further agrees that if awarded the contract he will commence the work within 15 calendar days after receipt of written notice to proceed and that he will fully complete

ready for use not later than 1 November 194 .

Security (bid bond - U. S. Standard Form No. 24) if required by the invitation is inclosed.

By _____

(Title)

Note: If the Bidder is a corporation, indicate State of Incorporation under signature; and if a partnership, give full names of all partners.

(Business Address)

(IF A CORPORATION, AFFIX CORPORATE SEAL)

Engineer Form No. 117
Revised 1 Feb. 1946

UNIT PRICE SCHEDULE

Item No.	Estimated Quantity	Unit	Description	Unit Price	Estimated Amount
1	1	Job	Removal of Existing Structures	\$ <u>L.S.</u>	\$ _____
2	1	Job	Diversion and Care of River and Dewatering Site	<u>L.S.</u>	_____
3	50	Acre	Clearing and Grubbing	_____	_____
4	92,000	C.Y.	Stripping	_____	_____
5	496,800	C.Y.	Excavation-Common	_____	_____
6	2,300	C.Y.	Excavation -Trench-To 6-Foot Depth	_____	_____
7	500	C.Y.	Excavation-Trench-Greater than 6-Foot Depth	_____	_____
8	119,300	C.Y.	Excavation-Borrow Random & Impervious	_____	_____
9	111,100	C.Y.	Excavation-Borrow Pervious	_____	_____
10	53,100	C.Y.	Excavation-Rock	_____	_____
11	150,000	C.Y.	Placing and Compacting Impervious Fill	_____	_____
12	204,000	C.Y.	Placing and Compacting Random Fill	_____	_____
13	174,000	C.Y.	Placing and Compacting Random Fill	_____	_____
14	100,900	C.Y.	Semi-Compacted Fill	_____	_____
15	20,000	Square	Additional Rolling	_____	_____
16	6,000	C.Y.	Hand Compacted Fill	_____	_____
17	44,000	C.Y.	Selected Gravel	_____	_____

Serial No. 19-023-47-

UNIT PRICE SCHEDULE

Item No.	Estimated Quantity	Unit	Description	Unit Price	Estimated Amount
18	4,100	C.Y.	Screened Gravel	\$ _____	\$ _____
19	34,000	C.Y.	Gravel Backing	_____	_____
20	800	C.Y.	Sand	_____	_____
21	85,700	C.Y.	Dumped Rock Fill	_____	_____
22	7,500	C.Y.	Cobble Facing	_____	_____
23	5,200	C.Y.	Derrick Stone	_____	_____
24	43,300	C.Y.	Concrete in Abutments Spillway and Discharge Channel Walls	_____	_____
25	7,250	C.Y.	Concrete in Stilling Basin Floor Slab and Baffles	_____	_____
26	175	C.Y.	Concrete-Miscellaneous	_____	_____
27	1,800	C.Y.	Porous Concrete	_____	_____
28	72,500	Bbls.	Portland Cement	_____	_____
29	387,500	Lb.	Steel, Reinforcement	_____	_____
30	4,100	Lb.	Copper Water Stops	_____	_____
31	1	Job	Miscellaneous Metal	L.S.	_____
32	1	Job	Tile Gage	L.S.	_____
33a	900	L.F.	Bituminous Coated Perforated Corrugated Metal Pipe-10 Inch	_____	_____
33b	2,300	L.F.	Bituminous Coated Perforated Corrugated Metal Pipe-12 Inch	_____	_____
34	1	Job	Spillway, Stilling Basin and Embankment Piezometers and Settlement Gages	_____	_____

Engineer Form No. 1618
Approved 1 Feb. 1946

B.S.

UNIT PRICE SCHEDULE

Item No.	Estimated Quantity	Unit	Description	Unit Price	Estimated Amount
35	500	L.F.	Downstream Piezometers	\$	\$
36	800	L.F.	Embankment Relief Wells		
37a	225	L.F.	Relief Well Collector Pipe-6-inch Conc.		
37b	1,400	L.F.	Relief Well Collector Pipe-12-inch R.C.		
38	35	L.F.	Asbestos-Cement Pipe -6-inch		
39	1	Job	Manhole	L.S.	
40	1	Job	Monorail Hoist	L.S.	
41	1	Job	Gasoline-Electric Standby Unit	L.S.	
42	1	Job	Installation of Equipment Furnished by the Government	L.S.	
43	1	Job	Oil Pressure System	L.S.	
44	1	Job	Electric Power, Lighting and Telephone Systems	L.S.	
45	5,000	C.Y.	Gravel Base for Roadway		
46	3,630	S.Y.	Bituminous Paving		
47	550	S.Y.	Cobble Cutters		
48	2	Acres	Seeded Topsoil		
49	326	L.F.	Highway Guard Rail		
50	1	Job	Gate Posts, Drop Inlet and Culvert Pipe	L.S.	

Serial No. 19-023-47

UNIT PRICE SCHEDULE

Item No.	Estimated Quantity	Unit	Description	Unit Price	Estimated Amount
51	60	L.F.	Water Supply Well	\$	\$
52	1	Job	Log Boom	L.S.	
53	1	Job	Equipment Building Superstructure	L.S.	
54	1	Job	Maintenance Building	L.S.	

Total, Items 1 to 54 Incl. \$

Engineer Form No. 1618
Approved 1 Feb. 1946

B.S.

PLANT AND EQUIPMENT SCHEDULE

Available Plant To Be Used

Excavation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Concrete and Batching Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Transportation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Earth Embankment Equipment
(Spreading and Rolling)

No.	Type	Capacity	Manufacturer	Age & Condition	Location
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

PLANT AND EQUIPMENT SCHEDULE

Available Plant To Be Used

Road Construction Equipment

No. :	Type :	Capacity :	Manufacturer :	Age & Condition :	Location :
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Compressed Air Equipment

No. :	Type :	Capacity :	Manufacturer :	Age & Condition :	Location :
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Material Handling Equipment.

No. :	Type :	Capacity :	Manufacturer :	Age & Condition :	Location :
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

Miscellaneous Equipment

No. :	Type :	Capacity :	Manufacturer :	Age & Condition :	Location :
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:
:	:	:	:	:	:

STATEMENT OF CONTRACTOR'S EXPERIENCE

This image shows a single page of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small dark speck is located near the top center, and another smaller one is near the bottom left. The paper appears slightly aged or off-white.

Date

WAR DEPARTMENT
United States Engineer Office
Boston, Mass.

Specifications for Construction of
Bennington Dam,
Bennington, New Hampshire

PART I

STATEMENT OF WORK

SW-1. DESCRIPTION OF THE WORK. -- (a) Work to be Done. -- (See Article 1 of the Contract.) The Work consists of furnishing all plant, labor, materials and equipment (except materials specified to be furnished by the Government) and performing all work in strict accordance with the plans, schedules, and these "Specifications for Construction of Bennington Dam, Bennington, New Hampshire," for construction of a rolled earth type flood control dam, concrete structures, highway, and appurtenant structures and facilities.

(b) Location. -- The site of the work contemplated by these specifications is located at Bennington, Hillsborough County, New Hampshire, on the Contoocook River. The site of the work is located on the Contoocook River approximately one-half (1/2) mile south of the village of Bennington, approximately at river mile 147 above the mouth of the Merrimack River.

(c) Appropriation. -- (To be inserted prior to advertising for bids).

(d) Authority. - The work provided herein is authorized by the Flood Control Act approved 22 June 1936 (Public No. 738-74th Congress) and the Flood Control Act, approved 28 June 1938 (Public No. 761-75th Congress).

SW-2. PRINCIPAL FEATURES. - The work to be performed includes the following principal features:

- (a) Handling traffic over the public highway in the vicinity of the work area during construction.
- (b) Removal of existing structures, facilities and utilities.
- (c) The construction of outlet works consisting of an approach channel, spillway and conduit structure, stilling basin and discharge channel, equipment and maintenance buildings.
- (d) Diversion and care of river during construction.
- (e) Construction of an earth dam of selected materials by the rolled fill method.
- (f) Construction of access roads.
- (g) Installation of Government furnished equipment and materials.

The above general outline of principal features does not in any way limit the responsibility of the contractor to perform all work and furnish all plant, labor and materials required by the specifications and the plans and drawings referred to therein.

GENERAL CONDITIONS OF SPECIFICATIONS TO LUMP SUM CONSTRUCTION CONTRACT
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PART II

GENERAL CONDITIONS

GC-1 SCOPE OF WORK. The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required by Article I of the contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the Contracting Officer from time to time during the construction in explanation of said drawings.

GC-2 CHARACTER OF WORK AND MECHANICS. The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

GC-3 SITE INVESTIGATION AND REPRESENTATIONS. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and condition of the ground, the character, quality and quantity of surface and subsurface materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract. Any failure by the Contractor to acquaint himself with all the available information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any understanding or representations made by any of its officers or agents during or prior to the negotiation and execution of this contract, unless (1) such understanding or representations are expressly stated in the contract and (2) the contract expressly provides that responsibility therefor is assumed by the Government. Representations made but not so expressly stated and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the Contractor and the Government will not be liable or responsible therefor.

GC-4 OPERATIONS AND STORAGE AREAS. (a) All operations of the Contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon Government premises. Government premises adjacent to the construction will be made available for use by the Contractor without cost whenever such use will not interfere with other Government uses

or purposes. The Contractor shall be liable for any and all damage caused by him to such Government premises. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

(b) Temporary buildings (storage sheds, shops, offices, etc.) may be erected by the Contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by Contractor without expense to the Government. Such temporary buildings and/or utilities shall remain the property of the Contractor, and will be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and/or utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state or local law or regulation. When it is necessary to cross curbs or sidewalks, protection against damage shall be provided by the Contractor and any damaged roads, curbs, or sidewalks shall be repaired by, or at the expense of the Contractor.

GC-5 BASE LINES AND GRADES. The Contractor shall lay out his work from base lines and grades established by the Government and shall be responsible for all measurements in connection therewith. The Contractor shall, at his own expense, furnish all stakes, templates, platforms, equipment, ranges, and labor that may be required in setting and cutting, or laying out any part of the work. The Contractor will be held responsible for the proper execution of the work to such lines and grades as may be established or indicated by the Contracting Officer and all stakes or other marks thus established shall be preserved by him until their removal is authorized by the Contracting Officer. The Contracting Officer will furnish, on request from the Contractor, all location and limit marks reasonably necessary for the conduct of the work.

GC-6 PROGRESS CHARTS, AND REQUIREMENTS FOR SUNDAY, HOLIDAY AND NIGHT WORK. (a) The Contractor shall within five days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall enter on the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof.

(b) The Contractor shall furnish sufficient forces, construction plant

and equipment, and shall work such hours, including night shifts, overtime operations and Sunday and holiday work, as may be necessary to insure the prosecution of the work in accordance with the approved progress schedule. If, in the opinion of the Contracting Officer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, days of work and/or the amount of construction plant, all without additional cost to the Government.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with the Delays-Damages Article of the contract.

GC-7 SUBCONTRACTORS. At the request of the Contracting Officer the Contractor will notify the Contracting Officer in writing of the names of all Subcontractors proposed for the work, as well as those Subcontractors who have been engaged previously, together with the extent and character of the work to be done by each Subcontractor. If, for sufficient reason, at any time during the progress of the work, the Contracting Officer determines that any Subcontractor is incompetent or undesirable, he will notify the Contractor accordingly and immediate steps will be taken for cancellation of such subcontract. Subletting by Subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relation between any Subcontractor and the Government.

GC-8 SAMPLES AND DESCRIPTIVE DATA. (a) Any samples and descriptive data required shall:

(1) Be submitted within the time specified in these specifications or, if no time be specified, within a reasonable time before use to permit inspection and testing.

(2) Be shipped prepaid and delivered as specified in these specifications, or as directed by the Contracting Officer.

(3) Be properly marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the work where the material represented by the sample is to be used, and the name of the Contractor submitting the sample.

(b) Samples not subjected to destructive tests may be retained until completion of the work but thereafter will be returned to the Contractor, if he so requests in writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any samples from the same manufacturer whose materials failed to pass the tests.

GC-9 PROTECTION OF MATERIAL AND WORK. The Contractor shall at all times protect and preserve all materials, supplies and equipment of every

description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the Contractor such property may be protected by the Government and the cost thereof may be charged to the Contractor or deducted from any payments due to him.

GC-10 PRESERVATION OF EXISTING VEGETATION. (a) The Contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Contracting Officer. The Contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stock piling of materials or tracking of grass areas by equipment.

(b) Care will be taken by the Contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations, shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The Contractor will be liable for or may be required to replace or restore at his own expense all vegetation not protected and preserved as required herein that may be destroyed or damaged.

GC-11 POSSESSION PRIOR TO COMPLETION. The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract. If such prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

GC-12 SUSPENSION OF WORK. The Contracting Officer may order the Contractor to suspend all or any part of the work for such period of time as may be determined by him to be necessary or desirable for the convenience of the Government. Unless such suspension unreasonably delays the progress of the work and causes additional expense or loss to the Contractor, no increase in contract price will be allowed. In the case of suspension of all or any part of the work for an unreasonable length of time causing additional expense or loss, not due to the fault or negligence of the Contractor, the Contracting Officer shall make an equitable adjustment in the contract price and modify the contract accordingly. An equitable extension of time for the completion of the work in the event of any such suspension will be allowed the Contractor, provided, however, that the suspension was not due to the fault or negligence of the Contractor.

GC-13 ACCIDENT PREVENTION, FIRE PREVENTION, AND SANITATION. The handbook, "Safety Requirements", approved by the Chief of Engineers 16 December 1941, as revised 1 January 1946, (copy of which is on file in the office of the authorized representative of the Contracting Officer on the project) and as may be amended, will govern in the prosecution of the work in accordance with the "Accident Prevention" article of the contract.

GC-14 LABOR REPORTS. As required by the Department of Labor, the Contractor shall promptly furnish, and shall cause any subcontractors to furnish in like manner, within seven days after the regular payment date of each weekly payroll, to the Contracting Officer, a copy of such payroll together with a sworn affidavit with respect to the wages paid each of its employees (which shall not be deemed to apply to persons in classifications higher than laborer and mechanic and those who are the immediate supervisors of such employees) engaged on the work. In addition the Contractor shall furnish, and cause any subcontractors to furnish in like manner, an additional copy of the payroll together with the sworn affidavit as indicated herein for the weekly payroll period ending nearest January 15, April 15, July 15, and October 15. The Contractor shall also prepare and furnish such other labor reports as may be required by the Department of Labor.

GC-15 CLEANING UP. The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from and about the premises and all tools, scaffolding, equipment and materials not the property of the Government. Upon completion of the construction the Contractor shall leave the work and premises in a condition satisfactory to the Contracting Officer.

PART III
SPECIAL CONDITIONS

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SC-24	Approval	III-18

PART III. SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION. - The contractor will be required to commence work under this contract within fifteen (15) calendar days after the date of the contract, to prosecute said work with faithfulness and energy, to complete the entire work ready for use not later than 1 November 19 . The time stated for completion shall include final cleanup of the premises.

SC-2. ESTIMATED QUANTITIES. - The quantities listed below are estimates only. Within the limit of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract prices whether it involves quantities greater or smaller than the following estimates:

Item No.	Estimated Quantity	Unit	Description
1	1	Job	Removal of Existing Structures.
2	1	Job	Diversion and Care of River and Dewatering Site
3	50	Acre	Clearing and Grubbing
4	92,000	C.Y.	Stripping
5	496,800	C.Y.	Excavation - Common
6	2,300	C.Y.	Excavation - Trench - To 6-Foot Depth
7	500	C.Y.	Excavation - Trench - Greater than 6-Foot Depth
8	199,300	C.Y.	Excavation - Borrow - Random & Impervious
9	111,100	C.Y.	Excavation - Borrow - Pervious
10	53,100	C.Y.	Excavation - Rock
11	150,000	C.Y.	Placing and Compacting Impervious Fill
12	204,000	C.Y.	Placing and Compacting Random Fill
13	174,000	C.Y.	Placing and Compacting Pervious
14	100,900	C.Y.	Semi-Compacted Fill
15	20,000	Square	Additional Rolling
16	6,000	C.Y.	Hand Compacted Fill
17	44,000	C.Y.	Selected Gravel
18	4,100	C.Y.	Screened Gravel
19	34,000	C.Y.	Gravel Lacking
20	800	C.Y.	Sand

Item No.	Estimated Quantity	Unit	Description
21	85,700	C.Y.	Dumped Rock Fill
22	7,500	C.Y.	Cobble Facing
23	5,200	C.Y.	Derrick Stone
24	43,300	C.Y.	Concrete in Abutments, Spillway and Discharge Channel Walls
25	7,250	C.Y.	Concrete in Stilling Basin Floor Slab and Raffles
26	175	C.Y.	Concrete - Miscellaneous
27	1,800	C.Y.	Porous Concrete
28	72,500	Bbl.	Portland Cement
29	387,500	Lb.	Steel, Reinforcement
30	4,100	Lb.	Copper Water Stops
31	1	Job	Miscellaneous Metal
32	1	Job	Tile Gage
33a	900	L.F.	Bituminous Coated Perforated Corrugated Metal Pipe - 10-inch
33b	2,300	L.F.	Bituminous Coated Perforated Corrugated Metal Pipe - 12-inch
34	1	Job	Spillway, Stilling Basin and Embankment Piezometers and Settlement Gages
35	500	L.F.	Downstream Piezometers
36	800	L.F.	Embankment Relief Wells
37a	225	L.F.	Relief Well Collector Pipe - 6 inch.
37b	1,400	L.F.	Relief Well Collector Pipe - 12 inch
38	35	L.F.	Asbestos Cement Pipe - 6-inch
39	1	Job	Manhole
40	1	Job	Monorail Hoist
41	1	Job	Gasoline Electric Standby Unit
42	1	Job	Installation of Equipment Furnished by the Government
43	1	Job	Oil Pressure System
44	1	Job	Electric Power, Lighting and Telephone System
45	5,000	C.Y.	Gravel Base for Roadway
46	3,630	S.Y.	Bituminous Paving
47	550	S.Y.	Cobble Gutters
48	2	Acre	Seeded Top Soil
49	326	L.F.	Highway Guard Rail
50	1	Job	Gate Posts, Drop Inlet and Culvert Pipe
51	60	L.F.	Water Supply Well
52	1	Job	Log Boon
53	1	Job	Equipment Building Superstructure
54	1	Job	Maintenance Building

SC-3. PAYMENTS. - (a) Payments will be made monthly as provided in Article 16 of the contract.

(b) Unless otherwise authorized in writing by the Contracting Officer, the items of work for which payment will be made shall be limited to those listed and enumerated in the contract. The unit prices or lump sum prices stated in the contract will be used in determining the amount to be paid and shall constitute full and final compensation for all the work.

SC-4. CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS. - Ten (10) sets of contract drawings, maps and specifications will be furnished the contractor without charge. Additional sets will be furnished on request at the cost of reproduction.

The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the U. S. Engineer Office, 3d Floor, Park Square Building, 31 St. James Avenue, Boston, Massachusetts:

<u>SHEET NO.</u>	<u>DRAWING NO.</u>	<u>DESCRIPTION</u>
	MERRIMACK VALLEY FLOOD CONTROL	
	BENNINGTON DAM	
	CONTOOCCOOK RIVER	
	<u>GENERAL</u>	
1	M 19-50/1	Project Location Plan and Index
2	M 19-50/2	General Plan and Sections
3	M 19-51/1	Hydrographs No. 1
4	M 19-51/2	Hydrographs No. 2
5	M 19-52/1	Plan of Foundation Exploration
6	M 19-52/2	Record of Foundation Exploration, No. 1
7	M 19-52/3	Record of Foundation Exploration, No. 2
8	M 19-52/4	Record of Foundation Exploration, No. 3
9	M 19-52/5	Record of Foundation Exploration, No. 4
10	M 19-52/6	Record of Foundation Exploration, No. 5
11	M 19-52/7	Geological Profiles No. 1
12	M 19-52/8	Geological Profiles No. 2

SHEET NO.DRAWING NO.DESCRIPTIONEARTHWORK AND RELATED STRUCTURES

13	M 19-53/1	Earthwork Distribution, Building,/ Grading and Camber Details
14	M 19-53/2	Plan of Borrow Areas
15	M 19-53/3	Record of Borrow Exploration, No. 1
16	M 19-53/4	Record of Borrow Exploration, No. 2
17	M 19-53/5	Embankment Sections, No. 1
18	M 19-53/6	Embankment Sections, No. 2
19	M 19-53/7	Plan of Excavation
20	M 19-53/8	Main Access Road/Plan, Profile and Sections
21	M 19-53/9	West Access Road and/Miscellaneous Details
22	M 19-53/10	Embankment Drainage
23	M 19-53/11	Embankment Nose Details

MASONRY STRUCTURES

24	M 19-54/1	Masonry Structures/General Plan and Elevations
25	M 19-54/2	East Abutment/Plan, Elevation and Sections
26	M 19-54/3	West Abutment/Plan, Elevations and Sections
27	M 19-54/4	Abutments/Reinforcing and Details
28	M 19-54/5	Discharge Channel Wall/East
29	M 19-54/6	Discharge Channel Wall/West
30	M 19-54/7	Spillway Sections
31	M 19-54/8	Spillway Reinforcing
32	M 19-54/9	Stilling Basin/Plan and Sections

MISCELLANEOUS METAL AND DETAILS

33	M 19-55/1	Piezometer and Settlement Gages
34	M 19-55/2	Air Vents
35	M 19-55/3	Miscellaneous Details No. 1
36	M 19-55/4	Miscellaneous Details No. 2
37	M 19-55/5	Miscellaneous Details No. 3
38	M 19-55/6	Tile Gages
39	M 19-55/7	Hoist Piping and Equipment

EQUIPMENT BUILDING

40	M 19-56/1	Equipment Building/Plans and Sections
41	M 19-56/2	Equipment Building/Elevators and Details
42	M 19-56/3	Equipment Building/Details No. 1
43	M 19-56/4	Equipment Building/Details No. 2
44	M 19-56/5	Equipment Building/Reinforcing
45	M 19-56/6	Equipment Building/Heating, Plumbing and Gasoline Systems

SHEET NO.DRAWING NO.DESCRIPTIONELECTRICAL SYSTEM

46	M 19-57/1	Electrical System/Wiring Diagram and Details
47	M 19-57/2	Electrical System/Conduit Layout No. 1
48	M 19-57/3	Electrical System/Conduit Layout No. 2
49	M 19-57/4	Electrical System/Duct Line, Plan and Details

REINFORCING SCHEDULE

50	M 19-58/1	Reinforcing Schedule
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MAINTENANCE BUILDING (TEMP. FIELD OFF.)

51	M 19-59/1	Maintenance Building/Plans & Details
52	M 19-59/2	Maintenance Building/Elevations and Details
53	M 19-59/3	Maintenance Building/Section and Details
54	M 19-59/4	Maintenance Building/Framing Plan & Detail
55	M 19-59/5	Maintenance Building/Heating and Plumbing
56	M 19-59/6	Maintenance Building/Electrical

The work shall also conform to such additional drawings in explanation of details as may be furnished by the Contracting Officer from time to time during construction.

SC-5. SHOP DRAWINGS. - The contractor shall submit to the Contracting Officer for approval four (4) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Three (3) sets of all shop drawings will be retained by the Contracting Officer and one (1) set will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be

construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility for any error which may exist as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work.

SC-6. PHYSICAL DATA. - The information and data furnished or referred to below are not intended as representations or warranties but are furnished for information only. It is expressly understood that the Government will not be responsible for the accuracy thereof or for any deduction, interpretation or conclusion drawn therefrom made by the contractor.

(a) Use of Local Materials. - Materials available at the project site and government furnished borrow areas may be used for furnishing materials for construction of the earth fill embankments and for processing for filters, bedding and concrete aggregate. A limited quantity of rock is available at these sources. The contractor will be required to furnish, as may be required, additional sources of rock for dumped rock fill, riprap, cobble gutters and derrick stone, and materials for the concrete aggregate and mortar.

(b) Sursurface Investigations. - Borings and test pits have been made at the dam site and at the borrow areas and laboratory analyses have been made of the samples of materials taken from some of the borings and test pits. Logs and locations of borings and locations of test pits and logs of representative test pits are shown on the drawings; logs of remaining test pits and borings are on file at the U. S. Engineer Office.

Boston, Mass. The samples and the results of the studies and the analyses pertaining to them may be examined at the U. S. Engineer Soils Laboratory, Watertown Arsenal, Watertown, Massachusetts. Seismic explorations made by the Government at the dam site indicate the existence of deeply buried rock overlaid with a layer of disintegrated rock. Location of many of the seismic lines are indicated on the drawings.

(c) Meteorological Data. - The climate is characterized by frequent weather changes. The winters are colder and longer than the summers. The tables of temperature and precipitation data given below are based on a summary of weather data recorded at the following four (4) U. S. Weather Stations for the indicated periods:

<u>Station</u>	<u>Length of Record</u>	<u>Type of Data</u>
Fitzwilliam, N. H.	Oct. 1930 - Dec. 1943	Precipitation
Keene, N. H.	Jan. 1924 - Dec. 1943	Temperature and Precipitation
Manchester, N. H.	Sept. 1930 - Dec. 1943	Temperature and Precipitation
Nashua, N. H.	Sept. 1925 - Dec. 1943	Temperature and Precipitation

Temperature - Degrees (F.)

Month	Aver. High	Aver. Low	Mean	Max. Recorded	Min. Recorded
Jan.	49.83	-9.99	24.29	66	-31
Feb.	50.55	-9.48	24.07	65	-32
Mar.	36.31	1.25	32.67	78	-13
Apr.	77.5	20.28	44.09	93	11
May	84.85	29.05	54.57	96	22
June	91.65	38.45	65.21	99	27
July	93.44	44.69	69.74	101	35
Aug.	91.18	42.28	67.51	98	27
Sept.	86.42	32.18	60.26	95	23
Oct.	77.77	20.61	47.28	88	0
Nov.	67.31	8.91	38.58	79	-15
Dec.	53.89	-3.31	27.43	70	-29
YEAR	71.20	17.91	46.31	101	-32

Precipitation					
Month	Aver. No. Days With 0.01" or More	Aver. Quan. (Inches)	Max. No. Days With 0.01" or More	Max. Quan. in Month (Inches)	Max. Quan. in 24 hrs. (Inches)
Jan.	11.04	3.34	18	7.15	1.98
Feb.	9.36	2.43	16	4.48	1.95
Mar.	10.62	3.69	20	9.64	2.63
Apr.	12.04	3.46	20	7.05	2.36
May	11.47	3.07	19	7.91	2.49
June	12.68	3.72	17	8.66	4.21
July	11.43	3.84	18	9.85	4.60
Aug.	10.59	3.61	17	6.86	2.85
Sept.	10.31	3.84	17	12.24	5.83
Oct.	9.98	2.97	18	6.54	2.59
Nov.	10.95	3.58	19	7.67	4.04
Dec.	9.67	3.12	17	7.30	2.27
YEAR	10.85	3.39	20	12.24	5.83

(d) Transportation. - (1) General. - The contractor shall make his own investigation of available roads, load limits of roads and bridges, availability of railroad sidings, and all other conditions affecting transportation of materials, equipment and personnel to the site of the proposed work. It shall be his responsibility to make all arrangements with the railroads for use of any sidings necessary for the delivery of materials and equipment.

(2) Roads. - Two (2) roads pass through the dam site. A concrete highway, U. S. Route No. 202, crosses the west abutment location and a bituminous surface treated road crosses the east abutment location of the proposed dam. A bridge in the village of Bennington, approximately one-half (1/2) mile north of the project site, connects these roads. These two (2) roads will be relocated by others to by-pass the dam site and until this relocation is accomplished, the existing roads shall remain

open for public travel. It is anticipated that the relocation of roads will be accomplished prior to the second season.

(3) Railroad. - A branch line of the Boston and Maine Railroad, serving the village of Bennington, passes through the location of the west abutment of the dam. This branch is to be abandoned after a presently abandoned line north of the village is rehabilitated by others. It is anticipated that the rehabilitation will be completed during the second season of construction on the dam. The existing branch line shall be kept open until rehabilitation of the other line has been completed.

SC-7. DATUM AND BENCH MARKS. - The plane of reference used in these specifications and on the drawings is mean sea level datum. Elevations in feet, as specified and as shown on the drawings are to be determined from bench marks located near the site of the work. The location, description and elevation (in feet) of the bench marks are as follows:

Monument No. 1, U.S.E.D. Disc, El. 735.15, located on a knoll approximately one thousand, one hundred (1100) feet east of the right bank of the Contoocook River.

Monument No. 2, U.S.E.D. Disc, El. 735.57, located on a knoll approximately two thousand, two hundred (2200) feet west of the left bank of the Contoocook River. Monument No. 2 is also approximately five hundred (500) feet west of U.S. Highway Route No. 202. The above elevations are above Mean Sea Level.

SC-8. BONDS. - (a) Payment Bond. - If the contract price exceeds \$2,000.00, the contractor agrees to furnish a payment bond with good and sufficient surety or sureties acceptable to the Government for the protection of persons furnishing material or labor in connection with the performance of the work under this agreement on U. S. Standard Form No. 25-A or U. S. Standard Form No. 25-C. The penal sum of such payment bond will be as follows:

(1) When the contract price is \$1,000,000 or less, 50% of the contract price; (2) when the contract price is in excess of \$1,000,000 and less than \$5,000,000, 40% of the contract price; (3) when the contract price is \$5,000,000 or more, \$2,500,000.

(b) Performance Bond. - If the contract price exceeds \$2,000.00, the contractor further agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 25-B. The penal sum of such performance bond will be 50% of the contract price.

(c) Any bonds required hereunder will bear the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

SC-9. PATENT INDEMNITY. - The contractor agrees to indemnify the Government, its officers, agents, servants and employees, against liability including costs and expenses for infringement upon any Letters Patent of the United States (except Letters Patent issued upon an application which is now or may hereafter be ordered to be kept secret under the provisions of the Act of 6 October 1917, as amended, 35 U.S.C.

42) occurring in the performance of this contract or arising (in respect

only of inventions which are actually embodied in items manufactured or supplied hereunder, or are involved in the use, unless there be more than one practicable use, of such items) by reason of the use or disposal of such items by or for the account of the Government.

SC-10. RATES OF WAGES. - (a) The minimum wages to be paid laborers and mechanics on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are as set forth below.

(b) Any class of laborers and mechanics not listed below employed on this contract shall be classified or reclassified conformably to the schedule set out below by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the Contracting Officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question, accompanied by the recommendation of the Contracting Officer, shall be referred to the Secretary of Labor for final determination.

CLASSIFICATION OF LABORERS
and MECHANICS

MINIMUM RATE OF
WAGES PER HOUR

To be inserted in final specification.

SC-11. GOVERNMENT FURNISHED MATERIAL OR EQUIPMENT. - The Government will furnish to the contractor as free issue, the following materials and equipment to be incorporated or installed in the work or used in its performance. Such materials and equipment will be furnished f.o.b. railhead nearest the project site, or f.o.b. truck at the project site, and the contractor will be required to accept delivery when made, pay any demurrage incurred, and unload and transport the materials or equipment to the job site at his own expense. All such

materials or equipment shall be installed and/or incorporated into the work at the expense of the contractor, unless otherwise indicated herein. Any materials or equipment so furnished which are excess upon the completion of the work shall remain the property of the Government. The contractor shall check the quantity and condition of such Government furnished material or equipment when delivered to him, acknowledge receipt thereof in writing to the Contracting Officer, and in case of damage to or shortage of such material or equipment, he shall, within twenty-four (24) hours report, in writing, such damage and/or shortage to the Contracting Officer.

<u>Quantity</u>	<u>Item</u>	<u>Description</u>
6 Sets	Conduit Liners	For Outlet Conduits
12 Each	Slide Gates	For Outlet Conduits
12 Each	Bonnets and Bonnet Covers	Outlet Conduits
12 Each	Gate Hangers	Outlet Conduits
12 Each	Hydraulic Hoists	Outlet Conduits
1 Outfit	Well Pump and Storage Tank	See Par. TP 13-12(g)
1 Each	Rotap Machine	

(The above equipment will be delivered by rail)

As Required	Grass Seed, (all types)-See Par. TP 10-04
As Required	Fertilizer and all Chemicals.- See Par. TP 10-04
As Required	Electric Lamps - See Par. TP 9-07

(The above materials will be delivered by truck)

SC-12. WATER. - The contractor shall, at his own expense, provide and maintain an adequate supply of water of a quality suitable for construction and domestic purposes. All temporary connections for water

shall be subject to the approval of the Contracting Officer.

At his own expense the contractor shall provide water to the Government field offices and to the laboratory at the concrete mixing plant (or wherever situated) for domestic and other purposes.

All temporary piping and connections shall be furnished, installed and maintained by the contractor in a workmanlike manner in such locations as are satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his own expense prior to completion of the construction.

SC-13. ELECTRICITY. - (a) Power for Contractors Use. - All electric current required by the contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines will be furnished, installed, connected, and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his expense prior to the completion of the construction.

(b) Power for Government Use. - The contractor shall furnish sufficient power for lighting and other miscellaneous uses in all Government buildings and at the project site during the period of the contract. The Government will pay the contractor monthly for power thus used in such Government buildings upon the submission of properly executed invoices by the contractor. The rate to be paid by the Government shall not exceed the lowest rate paid for power by the contractor at the project site during the month covered by the invoice. Without additional expense to the Government, the contractor shall furnish and install a suitable meter for measuring power used by the Government.

(c) Power Source. - The site of work is within the area served by distribution lines of the Public Service Company of New Hampshire. A 60-cycle, 2300 volt, single phase distribution line of limited capacity is available in the vicinity of the site of work. A three-phase line of 6600 volt capacity, extends along the Bennington - Greenfield Road approximately one-half (1/2) mile from the dam site.

SC-14. SEWERAGE FACILITIES. - The contractor shall, at the contractor's expense:

(a) Provide and maintain for his own use and the use of the Government forces adequate sewage disposal facilities and other sanitary facilities as may be required to meet local and State laws and regulations and to the satisfaction of the Contracting Officer:

(b) Remove, prior to final acceptance, in a workmanlike manner and to the satisfaction of the Contracting Officer, temporary sewage disposal and sanitary facilities installed by the contractor.

SC-15. OBSTRUCTION AND DANGER LIGHTS. - In addition to the requirements of paragraph GC-13 of these specifications, the contractor shall comply with all State and local laws and regulations relating to the use of public highways and to the maintenance of obstruction and danger lights and shall provide, erect and maintain at no additional expense to the Government all necessary safeguards including barricades, warning signs, and lights. The contractor will be held responsible for all damage resulting from failure to observe these requirements.

SC-16. PLANT. - The contractor agrees to keep on the job sufficient plant to meet the requirements of the work. Plant shall be

kept at all times in condition for efficient work, and subject to inspection of the Contracting Officer. The plant listed on the form "Plant and Equipment Schedule" submitted with the Bid is the minimum which the contractor agrees to place on the job unless otherwise determined by the Contracting Officer; its listing therein is not to be construed as an agreement on the part of the Government that it is adequate for the performance of the work.

No reduction in the capacity of the plant employed on the work shall be made except by written permission of the Contracting Officer. The measure of the "capacity of the plant" shall be its actual performance on the work to which these specifications apply.

SC-17. INSPECTION. - The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. The inspectors will direct the maintenance of the gages, ranges, location marks and limit marks in proper order and position. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the contractor from any requirements of the contract.

SC-18. PROTECTION OF EXISTING STRUCTURES, UTILITIES AND WORK. - The contractor shall protect all existing structures, utilities and work of any kind against damage or interruption of service. Damage or interruption of service resulting from failure to do so shall be repaired or restored promptly by or at the expense of the contractor.

SC-19. DAMAGE TO WORK. - The contractor shall be responsible for all work until completion and final acceptance thereof. However,

if the cofferdams are constructed in accordance with plans and progress schedule approved by the Contracting Officer and are overtopped by a flood which damages the cofferdams and/or any part of the permanent work, the contractor will make the repairs ordered by the Contracting Officer and in full compensation therefor will be paid the applicable contract unit prices or, in the absence thereof, an amount determined as an equitable adjustment under Article 3 - Changes of the Contract for all repairs of the cofferdams, and/or the permanent work which in the opinion of the Contracting Officer could not be protected from the flood damage.

Except as hereinabove provided, any and all damage to work (including temporary construction) utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the contractor's expense, regardless of the cause of such damage.

SC-20. FINAL EXAMINATION AND ACCEPTANCE. - As soon as practicable after the completion of the entire work or any divisible part thereof as may be designated in these specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted, and final payment thereof will be made in accordance with Article 16 of the contract.

SC-21. LIQUIDATED DAMAGES. - In case of failure on the part of the contractor to complete the work or any specified part of the work within the time fixed in the contract or any extensions thereof, the contractor shall pay the Government as liquidated damages the sum of Two Hundred Dollars (\$200.00) for each calendar day of delay until

the entire work is complete or accepted.

SC-22. CAMP FOR EMPLOYEES. - Subject to the approval of the Contracting Officer, and to such conditions, rules regulations as the Contracting Officer may prescribe, the contractor may construct, operate and maintain upon Government controlled or other property, at no additional cost to the Government, buildings and facilities for the housing and subsistence of employees. Such buildings and facilities shall be removed by the contractor in a workmanlike manner and to the satisfaction of the Contracting Officer upon completion of the work unless sooner ordered by the Contracting Officer.

SC-23. CONSTRUCTION ROADS. - The contractor shall construct, at his own expense, all construction roads required as access to borrow areas and items under construction, whether permanent or temporary, required to prosecute the work under the contract. All such roads shall be maintained during the required use of the roads. The location of all construction roads shall be subject to the approval of the Contracting Officer and shall not pass over private property without the written permission of the owners thereof. Prior to final acceptance of the work under this contract, unless otherwise specifically directed by the Contracting Officer, the contractor shall remove all traces of the construction roads which were constructed by him for use in the construction of the work specified under this contract by regrading the scarred areas to blend with the adjacent ground surface and to topsoil and seed the surfaces adjacent to areas containing vegetation. Required seeding shall be as specified in Section 10. Payment will not be made for materials and in roads constructed in connection with the

construction, maintenance and removal of cofferdams, auxiliary cofferdams, protective works, other temporary facilities, permanent structures, and borrow areas. All costs in connection therewith, including regrading and seeding, shall be included in the contract prices for the items for which the construction of the roads were required.

Quantities of materials removed from borrow areas for the construction and maintenance of construction roads will be deducted from the total excavation quantities, unless otherwise specified.

SC-24. APPROVAL. - This contract shall be subject to the written approval of the Chief of Engineers, War Department, Washington, D. C., and shall not be binding until so approved.

PART IV
TECHNICAL PROVISIONS
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SECTION I - REMOVAL OF EXISTING STRUCTURES (ITEM NO. 1)

TP-1-01. SCOPE OF WORK.

The structures existing within the clearing limits at the dam site as defined on the drawings, together with additional buildings designated on the drawings at the dam site, shall be removed in their entirety (except as otherwise specified) by the contractor. These structures consist of dwellings and their foundations, out buildings and their foundations, the brick gate house and gates on existing Powder Mill dam, fences, stone walls, test pit lagging, road surfacing on abandoned roads, and the road bed of the abandoned railroad within the limits indicated on the drawings. The railroad rails and ties will be removed by other agencies.

TP-1-02. REMOVAL OF PUBLIC UTILITIES.

Any existing utilities such as electric, telephone and telegraph lines, together with their poles, fixtures and service connections will be removed from the construction area by other agencies in advance of construction except that the contractor shall remove all electrical conductors attached to and part of the gate house, except that it shall be the responsibility of the contractor to provide electrical energy to the gate house until completion of the dam and removal of the gate house.

TP-1-03. RAILROAD CONDITIONS.

The railroad rails and ties will be removed by the Boston and Maine Railroad at a date approximately one year after the start of the contract. Until such time as the railroad service is discontinued on the railroad, the contractor shall not interfere in any way with the operation of the railroad and shall construct and maintain any railroad crossings necessary for his operations. Before constructing temporary crossings, the contractor shall submit drawings and obtain approval

from the Boston and Maine Railroad and the Contracting Officer. The contractor shall maintain flagmen at all temporary crossings at such times as directed by the Contracting Officer or required by the Railroad Company.

TP-1-04. MAINTENANCE OF ROADS

U. S. Highway Route 202 shall be maintained during the first season of operations and the contractor shall not interfere with traffic thereon until such time as approval of its closure has been received from the State of New Hampshire. The contractor shall request this approval and also approval of the town of Bennington for closing the town road on the east side of the river at least 30 days in advance of the date upon which he wishes to close the road. After closure of the road, the contractor will not be required to maintain a detour.

TP-1-05. FOUNDATIONS OF BUILDINGS

Building foundations shall generally be removed to a level two (2) feet below the finished ground surface. Building foundations in part or entirely within the dam foundation or approach and discharge channel excavations shall be removed in their entirety. The foundation or cellar holes shall be filled to the finish grade of the surrounding ground in conformance with applicable requirements of Section 5. The gate wells in the gate house shall be filled with brick removed from the structure. The top of the fill shall be graded off smooth at the floor level with a top course of gravel. Prior to filling the gate wells, the gates shall be carefully removed and will become the property of the Government. Gates shall be stored at the damsite as directed by the Contracting Officer.

TP-1-08. DISPOSAL OF MATERIALS.

Materials obtained from the removal of existing structures shall become the property of the contractor, except as otherwise specified
B.S.

and shall be salvaged or disposed of by him. All parts of the buildings shall be removed from the site as soon as possible after the buildings have been dismantled. Buildings may be used by the Contractor for office, storage, or housing during the construction period provided that the buildings do not interfere with the proper prosecution of the work as approved by the Contracting Officer, and provided further, that the buildings permitted to stand shall be disposed of as specified before completion of the contract. Material not salvaged shall be burned or otherwise satisfactorily disposed of as approved by the Contracting Officer. All material not having any merchantable value and designated to be wasted shall be disposed of in approved spoil areas. (See paragraph TP-3-03.)

TP-1-07. PAYMENT

Payment for furnishing all plant, labor, equipment and material and performing all work necessary for the removal of existing structures as specified herein will be made at the contract lump sum price for Item No.1, "Removal of Existing Structures". The contract lump sum price shall include all costs for dismantling the structures, placing and compacting fill in foundation holes, removing salvagable materials from the site, depositing waste material in spoil areas, and all incidental work in connection therewith. Payment for any additional fill required to fill holes will be made at the applicable contract unit prices for common or borrow excavation, Items Nos. 5, 8 or 9, Partial payments under Item I will be made in accordance with Article 16 of the contract.

SECTION 2 - DIVERSION & CARE OF RIVER AND DEWATERING SITE
(ITEM NO. 2)

TP-2-01. SCOPE OF WORK

The Contractor shall protect the permanent construction, build necessary cofferdams, divert and control at the site the Contoocook River and its tributaries after the first season of construction, and shall dewater the construction areas both above and below the ground water elevation as specified herein.

TP-2-02. DIVERSION OF THE RIVER

(a). The contractor, until the completion of the contract, shall satisfactorily control and direct the flow of the Contoocook River and tributaries at the site of the work so that no part of the permanent construction within the scope of these specifications or shown on the drawings will be damaged. In order to complete the embankment section of the dam, diversion of the river shall be made through the conduits in the overflow section and construction shall be protected by means of an upstream cofferdam with a minimum top elevation of 685. and a downstream cofferdam with a minimum top elevation of elevation 670. Diversion shall be made only after the contractor's plans for the construction of protective works, the dewatering plant and construction procedure have been submitted to and approved by the Contracting Officer, and only after the construction of these approved works have been completed and authorization to divert the river has been received in writing from the Contracting Officer. The drawings submitted for approval shall show all cofferdam details and shall include loading assumptions, design computations and dewatering plant details. The foundations of the cofferdams shall be prepared by excavating all unstable material. The embankment of the cofferdams shall be designed for stability and proper drainage. Approval of the proposed cofferdams will not relieve the contractor from full

responsibility for the adequacy of the cofferdams against failure due to all causes except overtopping as referred to in paragraph TP-2-02-(c).

(b). Diversion shall not be effected until the following parts of the permanent work have been satisfactorily completed.

(1). The construction of the east embankment to elevation 686 and the west embankment to elevation 724, except at closure section. The ends of the embankment adjacent to closure section shall be constructed with 1 on 3 slopes.

(2). The construction of the abutment section to elevation 682.5.

(3). The construction of the discharge channel walls complete.

(4). The construction of the spillway to elevation 679.5.

(5). The placement of riprap and derrick stone in channels.

(6). The construction of the stilling basin.

(7). The installation of temporary bulkheads in passageways.

(c). After diversion has been effected, cofferdams shall be maintained by the contractor and the contractor shall assume full responsibility for the protective works as specified in paragraph SC-19 of Part III, and shall repair, without cost to the Government any damage to the permanent work due to flooding, provided water in the river at the upstream cofferdam does not rise above elevation 685. In the event of a flood of such height as to endanger the cofferdams by overtopping, the cofferdams shall be flooded or the crests of the cofferdams raised as directed by the Contracting Officer.

TP-2-03. CONTROL OF RIVER AND AUXILIARY COFFERDAMS.

(a). Prior to the authorized diversion, the control of the

river shall consist mainly of keeping the river free of debris and allowing the river to flow past the site unimpeded. Whatever auxiliary cofferdams and bulkheads are necessary to protect the excavations, structures and embankments shall be constructed and maintained by the contractor and all costs therefor shall be included in the contract lump sum price for Item No. 2.

(b). Any type of cofferdam or protective levee, including the construction of a sheet pile cutoff as may be necessary to meet the requirements may be used, subject to the approval of the Contracting Officer. The contractor shall be responsible for the adequacy of the design and the construction of any auxiliary cofferdam protection and for any damage to any part of the permanent or temporary work which may result from failure of the cofferdam or a washout.

TP-2-04. DEWATERING SITE.

The contractor shall provide all plant and equipment and shall do all pumping and other work necessary to dewater the cofferdammed area and to control the ground water and surface water in all construction areas. The water level shall be kept below the elevation of all foundations of the permanent structures throughout the construction period. The contractor shall be responsible for the installation of wells, sumps, subdrains, ditches, drains and any other special facilities necessary to dewater the site so that all construction work may be performed on dry foundations. All water from the pumping and draining operations shall be discharged outside the limits of the permanent work into natural water courses. Any damage resulting from the failure of the contractor's dewatering operations and any damage resulting from the failure of the contractor to maintain the foundation area of all structures in a suitably dry condition shall be repaired as directed by the Contracting

Officer without additional expense to the Government.

TP-2-05. MAINTENANCE OF COFFERDAMS.

It shall be the responsibility of the contractor to maintain the cofferdams at all times and to keep the conduits in the spillway section of the dam clear at all times during the diversion. In the event any part of the temporary or permanent work is damaged due to a rise in water caused by the failure of the contractor to keep the conduits clear, the damage shall be repaired by the contractor at no expense to the Government.

TP-2-06. REMOVAL OF COFFERDAMS.

After cofferdams are no longer required, and when approved by the Contracting Officer, they shall be removed by the contractor. Earth cofferdams or portions thereof that interfere with the construction of permanent work as shown on the drawings shall be removed and disposed of in approved spoil areas; the remaining parts of the cofferdams shall be graded to the level of the surrounding finished grades.

TP-2-07. CONTROL OF GROUND WATER IN SPILLWAY AND STILLING BASIN AREA.

(a). Existing Conditions. An "artesian" water condition exists in the rock underlying the stratum of overburden in the spillway and stilling basin foundation area. Wells have been driven into rock in the vicinity of the structures and it has been determined that the "artesian" head is sufficient to raise the water level to the existing ground surface.

(b). Pumping Tests. The Government has conducted a pumping test to determine the maximum amount of water which could be pumped continuously from the driven well. The drawdown in adjacent observation wells was measured during the pumping test. The well used for pumping in this test was an 8-inch cased well and is designated on the drawing as Drill Hole No. D-80. The observation wells consisting of 1-1/2 inch B.S.

pipe in a 3-inch drill hole are designated on the drawings as Drill Holes Nos. D-38, D-39, D-42, D-43, D-45, D-66, D-67, and D-75 to D-79 inclusive. Results of the pumping test are available in the U. S. Engineer Office, Park Square Bldg., and may be inspected upon request. It is expressly understood by the contractor that the results are furnished for information only and the Government will not be responsible for any deduction, interpretation or conclusion drawn therefrom by the contractor.

(c). Dewatering and Construction Requirements. The foundation areas of the spillway and the stilling basin, including the floor slab and walls, shall be dewatered as specified in paragraph TP-2-04, and the water pressures in the weathered zone of rock overlying the bed-rock in these areas shall be reduced prior to starting the excavation operations in the foundation areas for the spillway, stilling basin, and stilling basin walls. The reduced pressures shall be maintained until all concrete in the stilling basin floor slab has been poured and permitted to set at least 3 days, and the concrete in the spillway and stilling basin walls has been poured above elevation 670. The level of the ground water in the weathered zone of rock shall be maintained at a grade of at least two (2) feet below the elevation of the bottom of the structure foundations as indicated on the drawing. Well No. D-80 is available and may be used by the contractor as a pumping well during his construction operations. During this stage of construction all observation wells now installed as listed above and indicated on the drawing shall be maintained or replacement wells shall be installed and maintained to provide a method of measuring the water pressures in the critical foundation area. When construction has advanced to the stage specified and the necessity for reduction of the water pressures has

been eliminated, all wells shall be removed or filled to permit the embankment and concrete structures to be completed as indicated on the drawing. The floor of the spillway and stilling basin excavation shall be drained and maintained free from water during the construction operations as specified in Section 4. At least one (1) month prior to the start of excavation in the spillway and stilling basin area, the contractor shall submit to the Contracting Officer for approval, his plan for control of the surface and subsurface water. The plan shall show complete details of all features included in the methods proposed, including size and location of wells, pump capacities, piping layout and other pertinent information. Approval of the plan submitted shall not relieve the contractor from full responsibility for the adequacy of the dewatering system. The contractor will be required to increase the dewatering facilities as may be necessary at no extra cost to the Government. Submission of the drawing showing the increased facilities shall be made to the Contracting Officer in the manner specified above.

TP-2-08. PAYMENT.

(a). Payment for protecting the permanent construction from flooding; for all work in connection with diverting and controlling the Contoocook River and its tributaries; for the control of ground water at the site of the work and for the initial dewatering within the protective works will be made at the contract lump sum price for Item No. 2, "Diversion and Care of River and Dewatering of Site". The contract lump sum price shall include the cost of removing silt and other materials for the cofferdam foundation outside the established lines of the dam foundations; the cost of dewatering the cofferdams and for the removal of the cofferdams; the drilling of new wells, maintaining existing wells, pumping from wells and sumps, and all incidental costs in connection with

the dewatering work. The contract price for Item No. 2, also includes the costs of rebuilding and dewatering protective works in case of destruction except as covered in paragraphs (c) (d) and (e) below. Fifty percent (50%) of the contract price will be paid when the cofferdams and wells have been constructed and the entire working area within the cofferdam area has been dewatered. The remaining fifty percent (50%) will be paid when the cofferdams and wells have been removed as specified.

(b). No payment under other items of the contract will be made for cofferdams, auxiliary cofferdams, dewatering and protective works except that materials from required excavations may be used subject to approval of the Contracting Officer.

(c). If the water in the river at the upstream cofferdams rises above elevation 685. and overtops the protective works, payment for repairing all damage to the permanent work as ordered by the Contracting Officer will be made at the contract unit prices for the respective items of work, provided that the damage was not due to any fault or negligence of the contractor to construct and maintain the cofferdams as specified. An extension of contract time will be granted to the contractor. The additional time granted will be equal in calendar days to the delay caused by the flooding.

(d). In the event that after the cofferdams have been completed to their full height in accordance with the approved drawings and before all permanent work within the area has been completed, the area inclosed by the cofferdams is flooded at the direction of the Contracting Officer or by overtopping of the cofferdams due to causes beyond the control of the contractor, an allowance of two thousand dollars (\$2,000.00) for dewatering will be made to the contractor upon full resumption of work within the cofferdammed area, subject to the following provisions:

(1). Only one allowance will be made for overtopping during any one flood.

(2). Allowance will be made only during the period when cofferdams are required to protect the permanent work and during the period allowed for completion of the work under paragraph SC-1 of these specifications, but will not be made during any period of delay found to be due to any fault or negligence of the contractor.

(e). In the event the contractor is directed by the Contracting Officer to raise the crest of the cofferdams, payment will be made at the applicable contract unit price for the additional embankment; or in the event the contractor is directed to flood the cofferdammed area, payment for repairing damage and cleaning up will be based upon an equitable adjustment as determined under the appropriate articles of the contract.

SECTION 3.- CLEARING AND GRUBBING (ITEM NO. 3)

TP-3-01. SCOPE OF WORK.

The contractor shall clear and dispose of all trees, stumps, undergrowth, brush and rubbish within the clearing limits defined on the drawings. The contractor shall grub and dispose of all stumps, roots and other objectionable materials from the area within the limits of the foundations of the dam including a twenty-five (25) foot strip measured horizontally beyond and contiguous to the toe of the embankment. Spoil areas shall be cleared as necessary. Clearing or grubbing will not be included under this item for borrow areas, or for areas used by the contractor outside the limits shown.

TP-3-02. GENERAL.

(a). At the site of the spillway approach and discharge channels the contractor shall remove and dispose of all trees and other objectionable material. Objectionable material is defined as vegetation, peat, rubbish or debris, or such other material that may be encountered which, in the opinion of the Contracting Officer will not be suitable for inclusion in the construction materials or as a foundation for the various structures included in this contract. Stumps, brush, roots and other objectionable matter shall be removed from the material which is to be used in the construction of the embankment.

(b). Within the limits of the dam embankment and all structures the contractor shall remove and dispose of all trees and other objectionable material. In addition, all stumps and roots more than one (1) inch in diameter shall be grubbed out to a minimum depth of three (3) feet below the stripping line. Wherever practicable, stumps shall be dug out and removed by a stump pulling machine. Blasting methods shall be used only when authorized by the Contracting Officer.

Holes left as a result of the grubbing operations shall be filled with approved materials of the type specified in Section 5 or as approved by the Contracting Officer.

TP-3-03. DISPOSAL OF MATERIALS.

(a). Timber and cord wood obtained from clearing operations shall become the property of the contractor and shall be removed by him from the site. Material not salvaged by him shall be completely burned or otherwise satisfactorily disposed of. Stumps may be disposed of in the final grading of Borrow Area "A" provided that the contractor fills all interstices and provides an earth cover at least two (2) feet thick. The earth cover shall be topsoiled and seeded as specified in paragraph TP-4-06.

(b). Incombustible material may be disposed of in designated spoil areas. Material shall not be disposed of on the property of adjacent owners and care shall be taken not to inflict damage of any nature upon adjacent property. The contractor shall be responsible for compliance with all Federal, State and local laws and regulations relative to building fires on the site.

TP-3-04. MEASUREMENT AND PAYMENT.

(a). Measurement will be made by the acre of all areas cleared, or cleared and grubbed as specified. Measurement will not be made of open areas or meadowland. Clearing of isolated trees will be measured to the overhang of the individual tree.

(b). Payment of clearing will be made at the contract unit price for Item No. 3, "Clearing and Grubbing". The contract unit price shall include all costs of clearing and grubbing the areas specified and shown on the drawings and satisfactorily disposing of all material resulting therefrom.

(c). All costs of clearing and grubbing in borrow areas shall be included in the contract unit prices for Items Nos. 8 and 9. Clearing and grubbing areas for construction roads or for other purposes required by the contractor for his own use outside the clearing limits specified shall be performed at his own expense. Payment for filling holes due to grubbing operations will be made at the applicable contract unit prices for the classes of approved fill materials used.

SECTION 4 - EXCAVATION (ITEMS NOS. 4 TO 10)

TP-4-01. SCOPE OF WORK.- The contractor shall excavate whatever materials may be encountered, both above and below the water level in the river, to the lines and grades specified, indicated on the drawings, or directed by the Contracting Officer.

TP-4-02. GENERAL PROVISIONS.- (a) Classification.- All materials excavated will be classified as follows:

Stripping -- Item No. 4

Excavation - Common - Item No. 5

Excavation - Trench - to 6 foot depth - Item No. 6

Excavation - Trench - greater than 6 foot depth -
Item No. 7

Excavation - Borrow - Random & Impervious - Item No. 8

Excavation - Borrow - Pervious - Item No. 9

Excavation - Rock - Item No. 10

(b) Methods and Disposal.- Excavation and stripping may be carried on by any approved method and by the use of any excavating and hauling equipment especially adapted to the work. All operations in connection therewith shall be performed in accordance with a schedule of operations approved by the Contracting Officer. All excavated material, unless otherwise provided in these specifications, shall be removed to the lines and grades indicated on the drawings or established by the Contracting Officer. All suitable excavated material, as approved by the Contracting Officer, shall be used in the permanent work, unless otherwise specifically directed by the Contracting Officer. Whenever, for any reason, excavated material

approved by the Contracting Officer cannot be placed directly in the dam embankment or other permanent works, it shall be stock-piled at approved locations adjacent to the work until its use is authorized or required. The contractor will be required to conduct the excavating operations, insofar as is practicable, in such manner as to minimize stock piling. All excavated materials not approved by the Contracting Officer for use as specified above, or which are in excess of the requirements shall be placed in designated spoil areas, as shown on the drawings, or disposed of as approved by the Contracting Officer. Spoil areas shall be brought up uniformly with the heights of lifts limited to three (3) feet. The areas shall be graded to drain properly at all times. The materials in the spoil areas shall be traffic compacted, smoothly graded and evenly dressed after their deposit. Definite limits of the spoil areas shall be determined by the Contracting Officer.

(c) Construction Roads.— All construction and access roads, bridges and other works required for the contractor's use and convenience shall be constructed and maintained by the contractor at no expense to the Government, and before completion and final acceptance of the work under the contract, they shall be removed and their sites, regraded, and left in a condition satisfactory to the Contracting Officer.

(d) Shoring.— It shall be the responsibility of the contractor to protect his own and Government employees from danger of caving in of banks and of slides. The contractor shall also be responsible for the unfinished work. Shoring may be used at the

option of the contractor except that if shoring is considered necessary by the Contracting Officer and the contractor does not propose to use it, its use will be ordered by the Contracting Officer and all costs therefor shall be borne by the contractor. Shoring shall be erected in a safe and workmanlike manner and shall be placed to afford ready protection to, and ample clearance for, construction and inspection of the permanent work. Shoring shall be removed upon completion of the permanent work as soon as the construction operations do not require its use. Where shoring is used in lieu of excavation to full dimensions of the payment lines, payment for excavating will be made as though the excavation had been made to the payment lines shown on the drawings. Separate payment will not be made for sheeting and shoring as such, but all costs thereof shall be included in the contract prices for excavation.

(e) Pumping and Draining.-- (1) The contractor shall provide all necessary pumps to dewater the excavation areas and to keep the areas free from water during such time as the work is under construction.

(2) The contractor shall maintain the site of the work and the grounds immediately adjacent thereto free from collected surface water whenever in the opinion of the Contracting Officer, such water affects the safety and condition of the work. Such temporary drains and ditches shall be constructed as deemed necessary by the Contracting Officer and the sites of such ditches shall be restored prior to final acceptance.

(3) The drainage ditches around the foundation of the spillway, stilling basin walls and non-overflow sections of

the dam as shown on the drawings are provided to keep ground water below the surface of the bottom of the excavation in order that this surface will be in a workable condition at all times. The contractor shall maintain these ditches and pump all water collected by them until such time as the Contracting Officer gives written permission to stop this practice.

(4) Separate payment will not be made for pumping and draining as such (except as provided under Item No. 2) for temporary drains and ditches and restoration work; all costs thereof shall be included in the applicable contract prices for the work.

(f) Measurement.-- A survey of the site area of the specified work will be made just prior to the beginning of the work; all measurements will be based on this survey without regard to any changes in the site area that may occur during the prosecution of the work. Measurement for excavation will be made between the grades and slope lines indicated on the drawings or staked in the field and the ground surface as indicated by the above mentioned survey. Where payment lines are not shown for structures, measurement for payment will be made to a line starting eighteen (18) inches outside the bottom of the foundation and extending to the ground surface on a one on one (1/1) slope. The contractor shall remove material which has been deposited subsequent to the above-mentioned survey by floods, rains or other causes, and payment will not be made for such excavation except as provided in paragraph SC-19 of Section III. The slope lines, as shown on the drawings, indicate only the lines to which excavation and fill will be measured and

paid for under this contract and are not intended to, and do not represent the actual slope to which the excavation must be made to safely perform the work. The actual slopes may be greater or less than those indicated, depending on the material excavated and methods used in performing the work, but such changes will not change the measurement for payment from the original lines as specified above and as indicated on the drawings or staked in the field. The contractor will be required to backfill any excess excavation with approved material, or with additional concrete where excess excavations are adjacent to concrete structures, at his own expense.

(g) Payment.-- Payment for excavation will be made at the applicable contract unit prices for Items Nos. 4 to 10, inclusive. The contract unit prices shall include all costs of excavating, loading, hauling, handling, shoring, pumping and draining, (except for any pumping done under Item No. 2), and disposing of all materials as required. The contract unit price shall also include all costs of stock piling and rehandling that may be necessary and the dressing and grading of spoil areas.

TP-4-03. STRIPPING (Item No. 4).-- (a) Work Included.-- Stripping is defined as the removal of all materials, other than rock, to a maximum depth of three (3) feet below the original ground surface within the limits specified below. The contractor shall strip the area to be covered by the dam embankment to the depth necessary to remove all materials unsuitable for the foundation of the embankment as determined by the Contracting Officer. Where possible

the contractor shall avoid stripping any deeper than required in order to properly remove all unsuitable materials. Stripping will also be required for the approach and discharge channels, structure foundations, downstream terrace, access roads, and elsewhere as indicated on the drawings or as directed. The unsuitable material to be removed shall include top soil, organic matter, rubbish below the ground surface not removed by clearing and grubbing, boulders and detached pieces of rock less than one (1) cubic yard in volume, and any other objectionable material as described in paragraph TP-3-02(a). The Contracting Officer reserves the right at all times to specify the locations where stripping is necessary. The designated locations shall be kept free from all matter that would, in the opinion of the Contracting Officer, be objectionable in the dam embankment or other permanent work. The maximum depth to which excavation classified as stripping will be measured is three (3) feet below the original ground surface. Any excavation required to remove unsuitable material below a plane three (3) feet below the original ground surface shall be classified as common excavation.

(b) Disposal.-- Suitable top soil from stripping shall be stockpiled as approved by the Contracting Officer, or disposed of directly in place on areas to be top soiled as specified in paragraph TP-10-04. All other materials from the stripping operations shall be wasted as specified in paragraph TP-4-02(b).

(c) Measurement and Payment.-- (1) Stripping will be measured by the cubic yard in accordance with paragraph TP-4-02(f), of the actual volume removed to a maximum depth of three (3) feet

below the original ground surface.

(2) Payment for the area stripped will be made at the contract unit price for Item No. 4, "Stripping", in accordance with paragraph TP-4-02(g). Payment will not be made under this item for stripping borrow areas. No payment will be made under Item 4 for material removed in the stripping operations which lies below a maximum depth of three (3) feet below the original ground surface.

TP-4-04. COMMON EXCAVATION (ITEM NO. 5).-- (a) Scope of Work.--

Common excavation shall consist of the removal and satisfactory disposal of earth, clay, sand, gravel, and such hard and compact materials as glacial till, cemented gravel, and soft, broken or disintegrated rock that, in the opinion of the Contracting Officer, can be removed by hand, power shovels, scrapers or draglines without continuous and systematic blasting, barring or wedging; all boulders or detached pieces of solid rock less than one (1) cubic yard in volume; and the grading of finished surfaces of excavation. Common excavation consists of the removal of all material, except rock, lying below the surface after the completion of the stripping operation and the removal of all materials except rock outside the limits within which stripping is specified. The side slopes and bottoms of all excavated areas shall be graded to a smooth and uniform surface conforming to the elevations, alignment and slopes shown on the drawings. The Contracting Officer may require that overcuts in common excavation be replaced and compacted by the contractor at no expense to the government. Replacement of overcuts

shall be made with satisfactory material as directed by the Contracting Officer. Common excavation includes excavation for overflow and non-overflow masonry sections, approach and discharge channels, embankment cutoff trench, embankment toe trench, drain-pipe system under stilling basin, drainage ditches (except temporary drains and ditches), access roads, and other required common excavation as specified or shown on the drawings or as directed.

(b) Disposal.-- Material excavated as common excavation shall be used in the construction or disposed of as specified in paragraph TP-4-02(b).

(c) Measurement and Payment.--

(1) Common excavation will be measured by the cubic yard in accordance with paragraph TP-4-02(f).

(2) Payment for common excavation will be made at the contract unit price for Item No. 5, "Excavation - Common", in accordance with paragraph TP-4-02(g).

TP-4-05. TRENCH EXCAVATION. (ITEMS NOS. 6 AND 7).--

(a) Scope of Work.-- The contractor shall excavate and dispose of the materials in the trenches for electric conduit, relief well collector pipe, outfall drain, manhole, road culvert, water supply, and sewage disposal system to the lines shown on the plans, as specified, or as directed by the Contracting Officer. For pipe trenches, the bottom of the trench shall be carefully shaped to fit the circular form of the pipe, so that the pipe for its entire length will be firmly supported on its lower quadrant.

(b) Disposal.-- Material excavated from trenches shall be used to backfill trenches or otherwise disposed of as specified.

in paragraph TP-4-02(b).

(c) Shoring, Pumping and Draining.- Shoring, pumping and draining shall be provided as specified in paragraph TP-4-02(d) and (e).

(d) Measurement and Payment.- (1) Trench excavation will be measured by the cubic yard. Trenches up to and including six (6) feet in depth will be measured on a basis of a three (3) foot width (except as otherwise noted or directed) regardless of the actual slopes excavated or the width of trench required on account of necessary sheeting and shoring. Trenches more than six (6) feet in depth will be measured on a basis of a four (4) foot width (except as otherwise noted or directed) regardless of the actual excavation. Depth will be measured from the original surface or from the surface after stripping or after common excavation, whichever is applicable, to a point twenty-five one hundredths of a foot (0.25') below the pipe invert elevations shown on the drawings. Measurement for manholes will be to the payment lines shown on the drawings. Payment limits for electrical manholes and drop inlet will be made to vertical planes 2'-0" outside the neat lines of the concrete structure and to the underside of the concrete slab.

(2) Payment for trench excavation will be made at the applicable contract unit prices for Item No. 6, "Excavation - Trench - to 6-foot Depth," and Item No. 7, "Excavation - Trench - Greater Than 6-foot Depth," and in accordance with the provisions of paragraph TP-4-02(g).

TP-4-06. BORROW EXCAVATION (ITEMS NOS. 8 AND 9).-

(a) Scope of Work.- In the approved borrow areas, the

contractor shall excavate to the lines and grades directed by the Contracting Officer and shall transport the material required (in addition to that obtained from required excavations) for the construction of the dam embankment or other fills. Borrow areas indicated on the drawings will be made available by the Government at no cost to the contractor. Prior to the excavation of any materials for use in the embankment or fills, the borrow areas shall be stripped as specified in paragraph TP-4-03. To provide suitable approved embankment material, excavation shall be made to the depth and in the locations as directed by the Contracting Officer. Boulders encountered during the excavation and not used in the embankments shall be neatly stockpiled in designated places in the borrow areas. Materials taken from the borrow areas for the contractor's use or paid for under other pay items will not be included in the payment to the contractor under the payment items for borrow excavation. The exempt from payment items under "Borrow Excavation" include concrete aggregate, selected gravel, screened gravel, gravel backings, sand, cobble facing, stone for cobble gutters and any material used for construction roads and contractor's works.

(b) Description. - (1) Borrow area "A", the principal source of impervious material, is overlain by a heavy layer of random material of varying thickness. In order to obtain the largest possible yield of impervious material from this area without unnecessary handling or waste of the overlaying pervious material, the contractor shall excavate in this area, employing methods and schedules approved by the Contracting Officer. As far as practicable the impervious

layer of material shall be taken out to its full depth in order to obtain the maximum yield of this material from any location. The final side slopes in Borrow Area "A" shall be not greater than one on one (1/1). To minimize subsequent erosion, the contractor shall construct drainage ditches at the top of the slope and shall fertilize and seed the side slopes. Seed furnished by the Government shall be sown in accordance with the requirements of Section 10.

(2) Borrow Areas "B₁" and "B₂" are the principal sources of processed material and of pervious embankment material, respectively. Stock piles of excess processed materials, if suitable, may be used in the construction of required fill sections.

(3) Borrow Area "C" is an alternate source of pervious embankment material of finer gradation than in Areas "B₁" and "B₂".

(4) The Contracting Officer reserves the right to specify the location at which borrow excavation for any specific use will be made, the depth of cuts and lifts and the disposition of excavation material in the several sections of the dam embankment and may require the contractor to change the locations and depths of his excavating operations whenever such change is, in the opinion of the Contracting Officer, necessary to obtain the proper quality of material for the part of the dam embankment under construction, all at no extra cost to the Government. Stones larger than those permitted in the embankment shall be removed as specified in paragraph TP-5-04 (b). During and after excavation, the surfaces shall be so graded that all surface water will readily drain from the surfaces and the final surface areas will blend with the surrounding topography.

Topsoil stripped from each borrow area shall be stock piled and, after final grading of the excavated surfaces, shall be evenly distributed over the area fertilized and seeded. Boulders left in borrow areas shall not be left uncovered in the final grading of the borrow areas but shall be buried. Unsuitable material encountered in borrow areas shall be disposed of as specified in paragraph TP-4-02(b).

(c) Measurement and Payment.— (1) Borrow excavation will be measured by the cubic yard as specified in paragraph TP-4-02(f) with the basic survey being made after completion of clearing and stripping operations on the pits. The volume of all boulders one (1) cubic yard or more in volume encountered in the excavations will be deducted from the volume of earth measured for payment under Items Nos. 8 and 9. The volume of material obtained from borrow areas for use under Items Nos. 17, 18, 19, 20, 22, 45 and 47 or for use as concrete aggregate or other purposes of the contractor will be deducted from the quantities measured for payment in borrow areas.

(2) Payment for borrow excavation will be made at the applicable contract unit prices for Item No. 8, "Excavation - Borrow - Random and Impervious" and Item No. 9, "Excavation - Borrow - Pervious" in accordance with the provisions of paragraph TP-4-02(g). The contract unit price shall also include all costs of clearing, stripping, stockpiling of topsoil, and final grading, topsoiling, fertilizing and seeding of borrow areas, except that fertilizer and seed will be furnished by the Government without cost to the contractor. Payment for all boulders one (1) cubic yard or more in volume

encountered in borrow areas will be made at the contract unit price for Item No. 10 "Excavation - Rock".

TP-4-07. ROCK EXCAVATION (ITEM NO. 10).- (a) Scope of Work.-

The removal of all boulders one (1) cubic yard or more in volume encountered in stripping, including stripping of borrow areas, common excavation, trench excavation or borrow excavation and the removal of any ledge rock which requires continuous and systematic blasting, barring or wedging for its removal will be classified as rock excavation. Rock may be removed by any suitable method.

(b) Blasting.- The use of blasting methods will be permitted for rock excavation and to break up boulders into sizes convenient to handle. Blasting shall be conducted in accordance with the requirements of the handbook "Safety Requirements" for excavation, building, and construction, as designated in paragraph GC-13 of Part II. Blasting will be permitted only when proper precautions are taken for the protection of all persons, the work and the property. All damage done to the work or property shall be repaired by the contractor at his own expense. All operations of the contractor in connection with transportation, storage and use of explosives shall be approved by the Contracting Officer. The contractor shall be liable for all injuries or deaths of persons or damage to property caused by blasting operations. Approval by the Contracting Officer of the method blasting or the strength or amount of explosives will not relieve the contractor from his responsibility in the blasting operations.

(c) Disposal.- Material of suitable size obtained from

rock excavation may be used in the construction of the required rock fills. Rock disposed of in spoil areas shall not be placed in nests, but shall be distributed, the interstices filled with earth, and the rock finally covered with a minimum of six(6) inches of earth.

(d) Measurement and Payment.— (1) Rock excavation will be measured by the cubic yard in accordance with the provisions of paragraph TP-4-02(f). All boulders one (1) cubic yard or more in volume encountered in the excavations will be measured as rock excavation.

(2) Payment for rock excavation will be made at the contract unit price for Item No. 10, "Excavation - Rock". The contract unit price shall include all costs of furnishing all equipment and material and performing all work required to remove ledge rock, to break up of boulders, all handling, hauling, stockpiling and disposing of the material as specified. All costs of further breaking up of stone required to make suitable sizes for use in the permanent construction shall be included in the respective contract prices for other items of work.

SECTION 5 - EMBANKMENT AND FILL (ITEMS NOS. 11 to 23 INCLUSIVE)

TP-5-01. SCOPE OF WORK. The contractor shall construct the dam embankment and other fills necessary to complete the work as shown on the drawings or as specified. Included within the scope of this work are the following operations: foundation preparation, placing and compacting embankment material, placing and compacting fill around structures, furnishing and placing gravel, sand, cobble facing and rock fill. Construction of gravel base for roadways and seeded top soil are not included in the scope of this section of the specifications.

TP-5-02. GENERAL PROVISIONS. (a) Classification. The items included under this section are classified as follows:

Placing and Compacting Impervious Fill - Item No. 11

Placing and Compacting Random Fill - Item No. 12

Placing and Compacting Pervious Fill - Item No. 13

Semi-compacted Fill - Item No. 14

Additional Rolling - Item 15

Hand Compacted Fill - Item No. 16

Selected Gravel - Item No. 17

Screened Gravel - Item No. 18

Gravel Backing - Item No. 19

Sand - Item No. 20

Dumped Rock Fill - Item No. 21

Cobble Facing - Item No. 22

Derrick Stone - Item No. 23

(b) Lines and Grades. The dam embankment shall be constructed to the lines and grades indicated on the drawings or

otherwise required by the Contracting Officer and shall be increased by such heights and widths as shown on the drawings or as may be determined necessary by the Contracting Officer to allow for subsequent shrinkage or settlement.

(c) Materials. (1). Materials for the various sections of the dam embankment and other required fill sections shall conform to the respective requirements specified in the following paragraphs of this section and may be obtained from required excavations and from borrow areas. The order and location of required excavations and of borrow area excavation and the disposal in the embankment of the materials from these excavations shall be subject to the direction of the Contracting Officer. Brush, roots, sod, perishable or other objectionable materials as determined by the Contracting Officer shall not be placed in the embankment. Any objectionable material placed in the embankment shall be removed by the contractor as directed by the Contracting Officer without cost to the Government. Material shall not be placed in the embankment when either the material or the foundation upon which they are to be placed is frozen.

(2) Any embankment material lost, displaced, or loosened after being placed in the embankment and before the completion of the contract and acceptance of the completed work because of floods or other actions of the river, because of any operation of the contractor, or for any causes that in the opinion of the Contracting Officer were avoidable or under the control of the contractor shall be replaced to the satisfaction of the Contracting

Officer and at no additional cost to the government, except as may be provided in Section 2.

(d) Slides. In case of slides in any part of the embankment during the construction or after completion, but prior to the final acceptance of the work, the contractor shall cut out and remove such material as may be required by the Contracting Officer and then rebuild the damaged part of the embankment in accordance with these specifications. In the event it is determined that the slide is a result of the fault of the contractor, the foregoing shall be performed at no cost to the Government. Where the slide is due to no fault of the contractor, as determined by the Contracting Officer, the excavation and other items of work required in the reconstruction work will be paid for at the applicable contract unit prices for the various items of work.

(e) Conduct of the Work. The contractor shall at all times maintain the dam embankment in a manner satisfactory to the Contracting Officer until the final completion and acceptance of all work under the contract. The contractor may be required to suspend work at any time, when, in the opinion of the Contracting Officer, satisfactory work cannot be done on account of rain, snow, floods, cold weather, or other unsatisfactory conditions. The Contracting Officer may require the contractor to remove, without additional cost to the Government, any material placed by the contractor outside of specified slope lines, except material required to be placed to allow for shrinkage or settlement.

(f) Shrinkage and Settlement. Except for the material

placed to meet the camber requirements indicated on contract drawings, any additional embankment material required by the Contracting Officer to allow for shrinkage and settlement during construction will not be measured and paid for as fill in the embankment as such quantities are not deemed determinate.

(g) Measurement.- The volume of the dam embankment to be paid for will be measured between the ground surface after stripping and excavation and the lines, slopes and grades of the finished embankment, including camber requirements, as shown on the drawings or as established by the Contracting Officer.

TP-5-03. PREPARATION OF FOUNDATION FOR DAM EMBANKMENT.

(a) General. The foundation for the dam embankment shall be excavated or stripped to the depth and extent specified and indicated on the drawing. The suitability of each part of the foundation for placing embankment materials thereon will be determined by the Contracting Officer. Immediately prior to the placing of materials in the embankment, after stripping and excavation have been completed, the entire foundation for the embankment shall be thoroughly plowed or scarified to a depth of four (4) inches wherever practicable in the opinion of the Contracting Officer and shall be leveled and rolled with the six (6) passes of sheepsfoot rollers described in paragraph TP-5-04 (d)(1). The furrows shall run approximately parallel to the axis of the embankment. All roots, stones larger than six (6) inches, debris or other objectionable material shall be removed and burned or spoiled as directed by the Contracting Officer. The foundation upon which earth fill or filter material is placed shall be in a suitably dry condition as

determined by the Contracting Officer. The above requirements for plowing and compacting do not apply to the side slopes of the cut-off and toe trenches.

(b) Filling Stump Holes, Test Pits. Stump holes, test pits and other excavated areas shall be filled with approved material as directed by the Contracting Officer. Prior to filling the holes the sides of holes shall be broken down and flattened with bulldozers or disc harrows in preparation for placing the fill materials. The fill shall be placed in layers and moistened and rolled whenever in the opinion of the Contracting Officer it is possible to do so. Materials which cannot be compacted by roller equipment on account of clearances shall be spread in four (4) inch layers and compacted with approved power tampers, as described in paragraph TP-5-04(d)(2), to obtain the density required for similar materials in the dam embankment.

TP-5-04. ROLLED EMBANKMENT. (ITEMS NOS. 11 TO 13 INCLUSIVE)

(a) General. Impervious, random and pervious sections of the embankment shall be brought up to a crown running parallel with the longitudinal center line of the dam. The slopes of the crown shall be approximately on a two percent (2%) grade toward the edge of the embankment. In order that the random and pervious sections may be constructed in a well drained plane, these slopes shall be maintained until the embankment construction is completed. As promptly as practicable after the foundation has been prepared, as directed by the Contracting Officer, the embankment shall be brought up with uniformly thick layers along the entire length of this section of the embankment being placed. End slopes of the

embankment at the closure section shall be one on three (1/3) and the material in these sloped surfaces shall be thoroughly harrowed at the time of completing the closure in order to effectively bond the previously placed and newly placed materials.

(b) Furnishing and Placing. Materials of the proper types from the required excavations or borrow areas shall be placed in the embankment at locations approved by the Contracting Officer. Selection of these materials shall be as directed by the Contracting Officer. Any stones which would be retained on a six-inch (6") screen will not be permitted in the compacted fill sections of the dam embankment. Should stones of such size be found in the otherwise approved earth fill embankment material, they shall be removed by the contractor either at the site of the excavation or after transporting to the embankment but prior to compacting the materials in the dam embankment. Materials may be transported by any approved method. The dumping of successive loads from the borrow areas or required excavations on the embankment shall be at locations as directed or approved by the Contracting Officer. Sufficient excavating and hauling equipment shall be available so that not less than two (2) sources of material can be worked at the same time. After dumping, the materials for the impervious and random sections shall be bulldozed or otherwise spread in layers not exceeding six (6) inches in thickness before rolling. The pervious material shall be spread in layers not exceeding nine (9) inches in thickness before rolling. Should the material of various sections of the embankment be too high in water content when dumped, it shall be bulldozed or otherwise spread in six-inch (6") layers, scarified and left for a sufficient time to allow the surplus water

to dry out before rolling. If in the opinion of the Contracting Officer, the rolled surface of any layer of the random and impervious materials is too smooth to bond properly with the succeeding layer, or if the materials have dried out sufficiently to cause cracks in the surface they shall be roughened or loosened by disc harrows or other approved means to the satisfaction of the Contracting Officer. The surfaces shall be wetted and tamped as required before the succeeding layer is placed thereon. The entire surface of the embankment shall at all times be maintained in such condition that construction equipment can travel thereon. Routing of construction equipment on the embankment shall at all times be subject to direction by the Contracting Officer.

(c) Moisture Control. In order to obtain the desired degree of compaction, the materials when rolled shall have the optimum moisture content practicable for the type of compaction equipment used and for the type and gradation of materials available with moisture uniformly distributed throughout the layer. If required, the compacted surface shall be sprinkled as directed immediately before each new layer is placed and if the new layer is too dry, it shall also be moistened as directed. The contractor shall have available an adequate supply of water to provide the amount of water required, at all times. Jets shall not be directed at the embankment material with such force that the fine material will be washed out. The optimum moisture content for the impervious material is approximately six to thirteen (6-13%) by dry weight, but the Contracting Officer reserves the right

to specify the optimum moisture for a particular material and to vary the moisture content as may be required to effect the degree of compaction desired at no additional cost to the Government. The amount of sprinkling shall be controlled so that no free water will appear on the surface during or subsequent to compaction. The contractor shall obtain field moisture content without one percent moisture of the value specified.

(d) Compaction. (1) Equipment. Rolling shall be done by oscillative, double section sheepsfoot tamper rollers, liquid or sand ballasted, having tamping feet uniformly staggered over the cylindrical surface and equipped with cleaners, or by other satisfactory types of tamping rollers as approved by the Contracting Officer. Rollers shall be pulled by crawler type tractors weighing not less than twenty-thousand (20,000) pounds. The tractors shall be weighted or equipped with bulldozers to increase its total weight to not less than twenty-nine thousand (29,000) pounds. The tamping feet shall project not less than seven (7) inches from the roller's cylindrical surface and shall have a face area of not less than five (5) nor more than seven (7) square inches. The spaces shall be such as to provide a minimum of two and one-half ($2\frac{1}{2}$) tamping feet for each square foot of cylindrical surface. Addition or reduction in the number of tamping feet shall be made as directed by the Contracting Officer. The total weight of the roller in pounds divided by the total area of the maximum number of tamping feet in one (1) row parallel to the axis of the roller shall be not less than one hundred forty (140) pounds per square

inch tamping-foot area with the drum empty and not less than three hundred fifty (350) pounds per square inch with the drum weighted. The design and operation of the tamping rollers shall be subject to the approval of the Contracting Officer.

(2) Power Tampers. - Tampers for use in areas inaccessible to rolling equipment shall be power motivated tampers weighing not less than thirty (30) pounds each and shall be especially adapted to operation in such areas and capable of compacting all materials to the same density by the tractor drawn roller.

(3) Rolling - Impervious and Random. When the moisture content and condition of the spread layers are satisfactory to the Contracting Officer, the contractor shall roll the impervious and random sections of the embankment with equipment described in the preceding paragraph, traveling at a speed of approximately two and one-half ($2\frac{1}{2}$) miles per hour. Each square foot of each layer of the embankment material shall be compacted by not less than six (6) passes of the rollers. Each pass of the roller shall overlap the adjacent rolled area by at least two (2) feet. Failure to comply with this requirement for careful rolling will be a cause for additional passes of the roller at the contractor's expense. The contractor shall thoroughly roll the embankment at the junctions of the different types of fill extending the rolling specified herein onto the adjacent sections of the dam embankment to secure true bonding of the sections. Portions of the earth fill over which the roller cannot pass for any reasons shall be thoroughly compacted in four-inch (4") layers by tamping with power tampers to obtain the same degree of compaction as that obtained by rolling

a similar material as specified.

(4) Rolling - Pervious. Compaction of the pervious sections shall be accomplished by even routing of construction equipment consisting of crawler type tractors weighing not less than twenty-nine thousand (29,000) pounds with at least four (4) passes of the tractor treads on each square foot of each layer of the embankment area. Each pass of the treads shall overlap the adjacent rolled area by at least six (6) inches. Use of other equipment specially designed for compacting pervious materials will be approved provided results are equal to those obtained by the specified equipment.

(5) Tests for Compaction. Samples of all embankment materials for testing both before and after placement and compaction will be taken by the Contracting Officer at frequent intervals, and from these tests, corrections, adjustments and modifications of methods, materials, moisture content or requirement for additional compaction will be made in order to secure the desired compaction of the material in the embankment. In taking samples for control and record purposes, the contractor shall supply labor required to assist the inspector, as directed by the Contracting Officer, at no additional cost to the Government.

(6) Settlement and Piezometer Gages. One (1) set of foundation settlement gages and six (6) piezometer gages shall be furnished and installed progressively with the embankment construction. The method of installation shall be as shown on the drawings and as specified in paragraph TP-7-04.

(e) Measurement and Payment. (1) Measurement of the

quantities of materials placed and compacted will be made by the cubic yard between the foundation surfaces and the slope lines and grades as shown on the drawings as specified or directed by the Contracting Officer. All materials will be measured in place after compaction.

(2) Payment will be made at the contract unit prices for the following items:

Item No. 11 - Placing and Compacting Impervious Fill

Item No. 12 - Placing and Compacting Random Fill

Item No. 13 - Placing and Compacting Pervious Fill

Payment for furnishing and hauling the material will be made at the applicable contract unit prices as specified in Section 4. The contract unit prices for placing and compacting embankment and fill materials shall include all costs of preparing the foundation area, placing of materials, spreading the materials in layers, mixing, scarifying, removing objectionable stones or other material, wetting, rolling or tamping, trimming to line, and for all other work required to satisfactorily complete the rolled embankment.

TP-5-05. ADDITIONAL ROLLING (ITEM 15). (a) General. If the tests designated in paragraph TP-5-04 (d)(5) indicate that the desired results are not being secured by the compaction specified, additional rolling may be required by the Contracting Officer. Additional rolling shall consist of making not less than three (3) passes of the equipment appropriate for the type of embankment as specified in paragraph TP-5-04 over such designated areas. The passes of the equipment shall overlap the adjacent rolled area by at least the distance specified in paragraph TP-5-04 for the type

of equipment used to compact the embankment. This procedure will be repeated as often as is necessary to obtain the desired compaction.

(b) Measurement and Payment. (1) Measurement of additional rolling will be made for each square (one hundred (100) feet) compacted by each three (3) additional passes of equipment.

(2) Payment for additional rolling will be made at the contract unit price for Item No. 15 "Additional Rolling".

TP-5-06. SEMI-COMPACTED FILL (ITEM NO. 14). (a) General. Outside the limits of the dam embankment semi-compacted fill shall be placed as indicated on the drawings or as directed by the Contracting Officer.

(b) Material and Operation. Materials shall be as directed by the Contracting Officer and shall be placed in layers not exceeding twelve (12) inches in thickness. Layers shall be compacted by four (4) passes of the equipment as specified in paragraph TP-5-04 (d)(1) or by tamping with power tampers or tractor drawn equipment to obtain the compaction equivalent to that obtained by four (4) passes of the specified equipment.

(c) Measurement and Payment. (1) Measurement of the volume of semi-compacted fill will be made by the cubic yard between the ground surface after excavation, or established excavation limits, and the lines and slopes and grades indicated on the drawings or established by the Contracting Officer.

(2) Payment will be made at the contract unit price for Item No. 14 "Semi-Compacted Fill". The contract unit

price shall include all costs of placing of materials, spreading, mixing, wetting as required, scarifying, removal of objectionable material, and rolling or tamping. Payment for furnishing and hauling the material will be made at the applicable contract unit prices as specified in Section 4.

TP-5-07. HAND COMPACTED FILL (ITEM NO. 16). (a) General.

The contractor shall place, grade and compact by means of hand-tamping equipment material required for backfill of structures and trenches and in compacted embankments as directed. All fill within three (3) feet of concrete surfaces will be included under this item.

(b) Placing. Material shall be selected from suitable common or borrow excavation. Generally, material shall be placed in layers four (4) inches in thickness before compaction, and shall be wetted and tamped with power tampers of a type approved by the Contracting Officer, and shall be compacted to a density equal to that required for the adjoining rolled embankment. Backfilling for trenches shall be carefully performed and the original surface restored to the full satisfaction of the Contracting Officer. After pipes have been tested and approved, trenches shall be back-filled with the excavated materials which shall be made free from stones larger than four (4) inches. Each layer of backfill shall be deposited by hand shovelling and carefully rammed on both sides of the pipe, until a cover of not less than one (1) foot has been provided for the pipe. Trench backfill in roadways shall be compacted to ninety-five (95) percent density as determined by the

modified Proctor Test for density of materials.

(c) Measurement and Payment. (1) Measurement will be made by the cubic yard of the material placed within the lines and grades shown on the drawings or as specified. Measurement shall be made in place after compacting.

(2) Payment will be made at the contract unit price for Item No. 16 "Hand Compacted Fill" and shall include payment for removing stones and placing, wetting, compacting, grading, and trimming the material. Payment for furnishing and hauling the material will be made at the applicable contract unit prices as specified in Section 4.

TP-5-08. SELECTED GRAVEL (ITEM NO. 17). (a) General. The contractor shall furnish, place, grade and consolidate selected gravel required for bedding under dumped rock fills, in toe trenches and elsewhere as shown on the drawings or as directed by the Contracting Officer.

(b) Material. Selected gravel shall consist of hard, durable, clean gravel conforming to the following requirements:

<u>Square Mesh Sieve</u>	<u>Percent Passing</u>
6"	100
1"	60-85
1/4"	40-70
No.10 Tyler	25-55
No.48	10-30
No.200	0-5

It is anticipated that ample quantities of material meeting these specifications can be obtained by selection of material from Borrow Areas "A₁" and "B₂" shown on the drawing, but whether obtained from borrow areas shown or from other approved sources, the material

shall meet the above requirements. The Government does not guarantee that Borrow Areas "B₁" and "B₂" contains a sufficient quantity of material which can yield the required quantity of the material specified above. The responsibility shall be the contractor's to obtain all he can from Borrow Areas "B₁" and "B₂" and to supplement this quantity by obtaining additional material from his own sources at no extra cost to the Government.

(c) Placing. Gravel placed in the blanket under the compacted pervious fill and in the downstream toe of the embankment shall be compacted to meet the same requirements specified for the compacted pervious fill. Gravel placed in open joint sewage pipe trenches shall be placed and compacted as specified in paragraph TP-5-07.

(d) Measurement and Payment. (1) Measurement will be made by the cubic yard of the material placed within the lines and grades shown on the drawings.

(2) Payment will be made at the contract unit price for Item No. 17, "Selected Gravel", and shall include all costs of furnishing, selecting, hauling, placing and compacting the material. Selected gravel, if obtained from a borrow area, will be paid for under Item No. 17 only. Payment will not be made for its excavation under either Items Nos. 8 or 9, and the volume thereof will be deducted in computing the volumes removed from the borrow areas.

TP-5-09. SCREENED GRAVEL (ITEM NO. 18). (a) General. The contractor shall furnish, place, grade and consolidate screened gravel required in the drainage blanket under the stilling basin

slab and in other locations shown on the drawings.

(b) Materials. Screened gravel shall consist of hard, durable, clean gravel meeting the requirements for concrete course aggregate, proportioned in approximately equal quantities of $3/4$ " and $1\frac{1}{2}$ " size to meet the following grading:

<u>Square Mesh Sieve</u>	<u>Percent Passing</u>
$1\frac{1}{2}$ "	100
$3/4$ "	35-75
$3/8$ "	15-40
No. 4 Tyler	0-5

The above material may be obtained by processing natural material from Borrow Area "B₁".

(c) Placing. The material shall be placed to the depth and within the limits shown on the drawings or as directed by the Contracting Officer with such hand placing as may be necessary to maintain the required slopes, lines and grades. The material shall be placed in six-inch (6") layers compacted thickness and each square foot of each layer shall be compacted by no less than four (4) passes of a caterpillar tractor weighing between four (4) and eight (8) tons. Material not accessible to tractors shall be compacted by other means to equivalent compaction.

(d) Measurement and Payment. (1) Measurement will be made by the cubic yard of the screened gravel furnished and placed within the limits, lines and grades shown on the drawings.

(2) Payment will be made at the contract unit price for Item No. 18, "Screened Gravel". Payment shall include all costs of furnishing, hauling, placing and compacting screened gravel. Screened gravel obtained from borrow areas will be paid

for under Item No. 18 only; payment will not be made for its excavation under Items Nos. 8 and 9, and the volume thereof will be deducted in compacting the volumes removed from the borrow areas.

TP-5-10. GRAVEL BACKING (ITEM NO. 19). (a) General. The contractor shall furnish, place, grade and consolidate selected gravel required as bedding for riprap on the upstream face of the dam in the discharge channel bottom and slopes, under the downstream dike and elsewhere as shown on the drawings or as directed by the Contracting Officer.

(b) Material. Gravel backing may be obtained by selecting material from Borrow Area "B", graded as follows:

<u>Square Mesh Sieve</u>	<u>Percent Passing</u>
6"	100
1"	35-85
1/4"	20-60
No. 10 Tyler	10-35
No. 48	0-15
No. 200	0-5

(c) Placing. The gravel backing shall be placed and compacted to meet the same requirements that are specified for pervious fill in paragraph TP-5-04 (D)(4).

(d) Measurement and Payment. (1) Measurement will be made by the cubic yard of the material placed within the lines and grades shown on the drawings.

(2) Payment will be made at the contract unit price for Item No. 19, "Gravel Backing", and payment shall include all costs of furnishing, selecting, hauling, placing and compacting the material. Gravel backing, if obtained from borrow areas, will be

paid for under Item No. 19 only, and payment will not be made for its excavation under Items Nos. 8 and 9, and the volume thereof will be deducted in computing the volumes removed from the borrow areas.

TP-5-11. SAND (ITEM NO. 20). (a) General. The contractor shall furnish, place, grade and consolidate sand as required under the stilling basin slab and elsewhere as shown on the drawings or as directed by the Contracting Officer.

(b) Material. Sand shall consist of hard, durable, clean sand graded within the limits specified for fine aggregate for concrete. Material may be obtained by processing natural material from Borrow Area "B₁". The Government does not guarantee that Borrow Area "B₁" contains a sufficient quantity of material which can yield the required quantity of the material specified above. It shall be the contractor's responsibility to obtain all the material possible from Borrow Area "B₁" and to supplement this quantity by obtaining material from his own sources at no extra cost to the Government.

(c) Placing. The material shall be placed to the required slopes, lines and grades shown on the drawings. The material shall be so placed as to compact to a six-inch (6") layer and each square foot shall be compacted by no less than four (4) passes of light caterpillar tractors. Material not accessible to tractors shall be compacted by other means to equivalent compaction.

(d) Measurement and Payment. (1) Measurement will be made by the cubic yard of sand furnished and placed within the limits, lines and grades shown on the drawings or as approved by

the Contracting Officer.

(2) Payment will be made at the contract unit price for Item No. 20, "Sand". Payment shall include all costs of furnishing, hauling, placing and compacting sand. Sand obtained from borrow areas will be paid for under Item No. 20 only and payment will not be made for its excavation under Items Nos. 8 and 9 and the volume thereof will be deducted in computing the volumes removed from the borrow areas.

TP-5-12. DUMPED ROCK FILL (ITEM NO. 21). (a) General. The contractor shall furnish the materials and construct the dumped rock fills for the slopes, for the toe of the dam embankment, for the stone dike, and elsewhere as shown on the drawings.

(b) Materials and Placing. (1) Dumped rock fill shall be clean, hard, sound, unweathered, igneous or metamorphic rock, except that schist will not be accepted. Suitable rock, boulders and large cobbles from borrow areas and from the required excavations may be used. Rock necessary to supplement the rock removed from excavations shall be furnished by the contractor from his own sources. At any location at least fifty percent (50%) of the volume of dumped rock in the embankment shall consist of stones exceeding one half ($1/2$) cubic feet in volume, and not more than five percent (5%) of the material used shall pass a one-inch (1") sieve. The maximum allowed size of single pieces of rock shall be one (1) cubic yard; in no case shall the largest dimensions of the stone be greater than the thickness of the blanket in which it is being placed. Material placed in the dumped rock fill shall contain a sufficient number of large angular stones to

give stability to the entire mass.

(2) Dumped rock fill shall not be placed by hand except to rearrange surface stone to bring the surface to the required lines and grades. The rock shall be placed with larger rocks at the outer surface of the slope and smaller rocks concentrated adjacent to gravel bedding. Care shall be taken in dumping and placing the rock fill in such manner that the gravel backing is not disturbed. As the construction of the dam embankment progresses the rock slope shall be brought up in horizontal lifts of not more than five (5) feet and shall be kept at substantially the same level as the fill.

(3) The finished slopes of the embankment shall present a reasonably smooth surface with a variation not exceeding six inches (6") above or below the slope lines shown on the drawing. The finished surface of the embankment slope shall be arranged so that contrasting colors and shapes of stones are uniformly distributed as far as practicable.

(c) Measurement and Payment. (1) Measurement will be made by the cubic yard of dumped rock fill placed within the lines and grades indicated on the drawings or as directed by the Contracting Officer.

(2) Payment will be made at the contract unit price for Item No. 21 "Dumped Rock Fill". Payment shall include all costs of loading and hauling from stockpiles or other sources, selecting, placing, rearranging and trimming the dumped rock fill whether the material is obtained from required excavations, borrow

pits, stock piles or any other source. The cost of breaking up boulders into acceptable sizes, whether obtained from rock excavation or from culling borrow excavation, shall be included in the contract unit price for Item No. 21 "Dumped Rock Fill".

TP-5-13. COBBLE FACING (ITEM NO. 22). (a) General. Cobble facing for slope protection shall be placed on the down stream slope of the dam embankment as indicated on the drawings.

(b) Material and Placing. (1) Cobble facing shall consist of hard, durable, clean gravel conforming to the following requirements:

<u>Square Mesh Sieve</u>	<u>Percent Passing</u>
8"	100
3"	0-5

Material may be obtained by processing natural material obtained from Borrow Area "B₁" or by culling of surface stone during construction of the embankment. The Government does not guarantee that Borrow Area "B₁" contains a sufficient quantity of the material specified above. The responsibility shall be the contractor's to obtain all he can from Borrow Area "B₁" and to supplement this quantity by obtaining material from his own sources at no extra cost to the Government.

(2) Cobble facing shall be carefully placed to line and grade with the larger particles at the outer surface. The finished slopes shall be graded and trimmed to a uniform line as shown on the drawings.

(c) Measurement and Payment. (1) Measurement will be made by the cubic yard of cobble facing placed within the lines

and grades indicated on the drawings.

(2) Payment will be made at the contract unit price for Item No. 22, "Cobble Facing". Payment shall include the cost of loading and hauling from stockpiles or other sources, selecting, placing, rearranging and trimming the cobble facing.

TP-5-14. DERRICK STONE (ITEM NO. 23). (a) General. The contractor shall place a five-foot (5') bed of derrick stone in the discharge channel directly downstream from the stilling basin. The contractor shall also place derrick stone for road barriers and curb stones, as shown on the drawings.

(b) Material. The derrick stone layer shall consist of large angular fragments of rock obtained from rock excavation or other sources furnished by the contractor. The stones shall be in pieces weighing not less than one (1) ton nor more than three (3) tons with a general average weight per piece of two (2) tons, and there shall be a tolerance of not more than five (5) percent in the amount of stone larger or smaller than the above mentioned limits. Stones shall be angular with the least principal dimension not less than one-third ($1/3$) the greatest dimension. The Contracting Officer reserves the right to reject any stone which in his judgment is too round in shape for the intended purpose.

(c) Placing. Derrick stone shall not be dumped directly into position, but shall be placed by the use of cranes or other suitable equipment. Derrick stone shall be placed and firmly bedded on the underlying bed of dumped rock fill in the discharge channel so that the weight of the stone is carried by the bedding

and not by the adjacent stones. The stone shall be placed to give a reasonably smooth surface so as not to offer an undue obstruction to the flow of water. The stone shall be set with close joints approximately vertical to the established lines and grades with a tolerance of not more than six (6) inches above or below the same. Stone for barriers and curbstones shall be spaced and set as detailed on the drawings.

(d) Measurement and Payment. (1) Measurement will be made by the cubic yard of derrick stone placed within the limits indicated on the drawings or as specified. Individual stones placed in barriers and curbstones will be measured for payment.

(2) Payment will be made at the contract unit price for Item No. 23 "Derrick Stone". Payment will include all costs of loading and hauling from stockpiles or sources, selecting, placing and trimming the derrick stone whether furnished from stockpiles or from any other source.

SECTION 7 - MISCELLANEOUS METAL ITEMS, EQUIPMENT AND STRUCTURES
(ITEMS NOS. 31 to 39 INCLUSIVE)

TD-7-01. MISCELLANEOUS METALS (Item No. 31)

(a). Scope of Work. The contractor shall furnish and install all required miscellaneous articles of steel, cast iron, wrought iron, brass, bronze, copper or other metals as shown on the plans or as directed by the Contracting Officer, except as specifically included under other payment items. Unless otherwise specifically designated to be paid for under other items, articles to be furnished are ladders, steel frames and covers, manhole frames and covers, service gate vent, pipe and pipe sleeves, settlement rods, pipe railing, chain, stair treads, float well and piping, anchor bolts, and any other miscellaneous metal articles, except equipment and devices, whether or not they are indicated on the plans, but which become necessary in the development of the detailed plans or for proper completion of the work, are to be furnished under Item No. 31 at no additional cost to the government.

(b). Material and Workmanship.

(1). All articles shall be fabricated according to the best shop practice and shall conform to the following Federal Specifications where applicable to the use intended:

<u>Material</u>	<u>Federal Specification</u>
Structural Steel	QQ-S-741
Steel Floor Gratings	RR-G-661a
Sheet Metal	QQ-I-716
Wrought Iron	QQ-I-686a
Wrought Iron Pipe	WW-P-441a
Cast Iron	QQ-I-652
Cast Iron Pipe	E-WW-P-421
Soil Pipe	WW-P-401
Corrugated Metal Culvert	QQ-C-806
Steel Pipe	WW-P-404
Malleable Iron Fittings	WW-P-521b
Copper Pipe	WW-T-799a
Brass	QQ-B-621a

MaterialFederal Specification

Zinc Coated Sheet Steel	QQ-1-716 Type II, Class DI
Solder	QQ-S-571a and QQ-S-551
Pipe Threads	GGG-P-351a
Safety Treads	RR-T-661 Type B, Class 6

(2). Standard manufactured products will be acceptable provided they comply in general with the requirements of the specifications and are approved by the Contracting Officer.

(3). Welding. Welding will be accepted only when specified or authorized and shall be done in accordance with the requirements of the American Welding Society.

(4). Galvanizing and Painting. Galvanized iron or steel as indicated on the drawings shall be galvanized by the hot dipped process. Such galvanizing shall be of a quality to endure at least six (6) immersions in copper sulphate solution conforming to ASTM Designation "A 239-41" for "Test for Uniformity of Coating By the Preece Test (Copper Sulfate Dip) on Zinc-coated (Galvanized) iron or steel articles". Injuries to galvanizing shall be satisfactorily repaired at the contractor's expense. Provision shall be made for protecting galvanized threads either by counter boring fittings to cover threads or by cutting threads to give a very loose fit before galvanizing and carefully rerunning threads after galvanizing to leave a good coating on all threads. Painting shall be in accordance with the requirements of Section 14.

(c). Settlement Rods. The contractor shall furnish and install in the lower pour in each corner of the spillway as indicated on the drawing, a three-quarter ($3/4$) inch rod, two (2) feet long with one (1) end projecting three (3) inches beyond the face of the concrete. Rods are to be used to measure the settlement of the spillway during construction. If, in the course of the construction and prior to completion of the spillway, it becomes necessary to cover the settlement rods, new rods shall be installed

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at higher elevations to permit continuance of the observations. The Government will make all measurements required to determine settlement.

(d). Float Well Drain. The gate valve installed in the base of float well shall be set in grout. The top of the grout shall be shaped to the invert of the valve. Before the grout is placed, the existing concrete up to the elevation of the centerline of the pipe shall be given one-brush coat of asphalt paint to reduce the bond.

(e). Payment. Payment will be made at the contract lump sum price for Item No. 31, "Miscellaneous Metals," and shall include all costs for furnishing and installing all metal work as specified above and required but not called for under other items of the contract. The cost of painting concrete with asphalt as specified in subparagraph (d) above shall be included in the lump sum price for Item No. 31.

TP-7-02. TILE GAGES (Item No. 32)

(a). General. The contractor shall furnish and install tile gages as located and detailed on the drawings.

(b). Material and Installation. The tile gages shall be furnished and erected in sections as shown on the drawings. The material shall be glazed black figures on glazed white fill of ceramic tile similar and equal to the product of the "Sparta Ceramic Company" East Sparta, Ohio. The tiles shall be 1-1/16" x 1-1/16" x 1/4", shall be assembled by pasting on sheet of paper in panels of one (1) foot lengths. Panels shall be constructed so that the foot marks are within one-eighth (1/8) inch of proper location. A sample sheet shall be furnished to the Contracting Officer for approval before erection. Figure sheets as received from the manufacturer shall be placed in an accurate mold on a glass plate and backed with cement mortar about one and one-half (1 1/2) inches thick. The mortar shall be a one to one (1:1) mix of cement and

sand of suitable consistency when combined with water and shall be reinforced with expanded metal or wire fabric. Reinforcing shall extend beyond both edges of the tile to form anchorages as shown on the drawings. After final set, molds shall be removed and the panels water-cured for a period of ten (10) days. The panels shall be installed in the recesses shown on the drawings, and grouted in place.

(c). Payment. Payment will be made at the contract lump sum price for Item No. 32, "Tile Gages," and shall include all costs of furnishing and installing tile gages as shown.

TP-7-03. BITUMINOUS COATED PERFORATED CORRUGATED METAL PIPE
(Item Nos. 32a and 32b.)

(a). General. The contractor shall furnish and lay ten-inch (10") and twelve-inch (12") bituminous coated perforated corrugated metal pipe for drains as shown on the drawings or as directed.

(b). Material.

(1). All pipe shall meet the requirements of Federal Specifications QQ-C-806 Type I, and in addition shall be completely coated inside and out with an asphaltic cement which shall meet the performance requirements set forth herein. The pipe shall also be perforated with four (4) rows of seven-sixteenth (7/16) inch diameter holes, two (2) rows three (3) inches apart in each lower quadrant. Holes shall be spaced longitudinally so that a hole in each row will be drilled in every ridge of the corrugations. Perforations are to be made before galvanizing.

(2). The asphalt cement shall be 99.5% soluble in carbon bisulphide.

(3). The entire inside and outside of the pipe shall be uniformly coated with a minimum thickness of three hundredth (.03) of an inch. (Thickness shall be measured on the crests of corrugations.)

(4). Stability Test. The asphalt cement shall have no loss in stability when subjected to the highest summer temperature as indicated by successfully withstanding the following tests: Parallel lines shall be drawn along the valleys of the corrugations of a representative sample of coated pipe and the specimen placed on end in a constant temperature oven, with the parallel lines in a horizontal position. The temperature of the specimen shall be maintained within two (2) degrees of one hundred fifty (150) degrees F. for a period of four (4) hours. At the end of this time no part of any line shall have dropped more than one quarter ($1/4$) inch.

(5). Impact Test. The coating shall adhere to the metal tenaciously and shall not chip off in handling as indicated by successfully withstanding the following tests: A steel ball two and one quarter ($2\frac{1}{4}$) inches in diameter and weighing 1.67 pounds shall be dropped from the height of seven and one-half ($7\frac{1}{2}$) feet through a vertical tube two and one-half ($2\frac{1}{2}$) inches inside diameter, upon the crest of the coated corrugation of a full round riveted section of culvert pipe. This test shall be conducted with the specimen at a temperature of thirty-two (32) degrees F. Failure of the coating on the inside of the corrugated pipe as indicated by spalling from the metal or the formation of cracks longer than one-half ($1/2$) inches from the point of impact shall be considered sufficient cause for rejection.

(6). Test For Imperviousness. The asphalt cement shall be impervious to liquids as indicated by the following test: A twenty-five (25) percent solution of sulphuric acid or a twenty-five (25) percent solution of sodium hydroxide or a saturated salt solution (such as sodium hydroxide) shall be held in the valley of a corrugation for a period of forty-eight (48) hours, during which time no loosening or

separation of the bituminous material from the galvanizing shall have taken place.

(7). Erosion Test. A representative sample consisting of a two (2) foot length of a fully coated pipe with perforations plugged and ends closed with bulkheads shall be revolved end over end about its transverse axis at a speed of 3.7 revolutions per minute, and in such a manner that the erosive charge shall alternately roll along the inner surface of the opposite sides of the pipe. At least seventy-five (75) percent of the sample shall be immersed as it revolves in a bath of water. The erosive charge shall be fifty (50) pounds of grade "M" building brick conforming to the requirements of the Federal Specification SS-B-656 for "Brick; Building (Common), Clay", broken up into pieces two to three (2-3) inches in size and three (3) gallons of water. The pipe shall not show areas of bare metal more than two (2) inches in length on four (4) of the seven (7) central corrugations after five (5) hours of continuous testing.

(c). Inspection.

(1). Mill and Shop Inspection. The contractor shall notify the Contracting Officer at least three (3) days in advance as to the date on which and the place at which the fabrication will begin. He shall provide free access at all times for the Contracting Officer or his authorized representative to all parts of the mill or shop where the pipe is being fabricated and bituminous coated and shall provide the necessary facilities and assistance for making thorough examinations. No material shall be shipped from the mill or shop until the contractor is notified by the Contracting Officer that the results of inspections and prescribed tests are satisfactory. Because standard testing equipment used in the above specified tests requires that the specimens or samples

be of fifteen (15) inches diameter, the contractor shall furnish without charge to the government, necessary samples which shall be bituminous treated at the same time and under identical conditions as the material to be delivered under this contract.

(2). It is understood that the successful passing of the test specimens will not eliminate the possibility of rejection at the site of the work in event the material as delivered does not pass field inspection.

(d). Laying Pipe. Proper care shall be used to avoid injury to the pipe in handling. The pipe shall be carefully bedded in the gravel bedding, laid true to lines and grades shown on the drawings or as established by the Contracting Officer, and shall be properly connected and jointed by approved sleeve couplings. The pipe shall be layed with the perforations down. The interior of the pipe shall be carefully cleaned after laying to remove any dirt or other foreign material. Gravel shall be carefully placed around the pipe so as not to disturb the line and grade. Any pipe disturbed shall be relaid by the contractor at his own expense.

(e). Measurement and Payment.

(1). Measurement of bituminous coated perforated corrugated metal pipe will be made by the linear foot from end to end of the completed drain in place as shown on the drawings.

(2). Payment will be made at the applicable contract unit price for Item Nos. 33a, for "Bituminous Coated Perforated Corrugated Metal Pipe, -10-inch and Item No. 33b for "Bituminous Coated Perforated Corrugated Metal Pipe - 12-inch," and shall include all costs of furnishing and installing the pipe and fittings except that excavation and fill shall be paid for at their respective contract unit prices.

TP-7-04. SPILLWAY, STILLING BASIN AND EMBANKMENT PIEZOMETERS
AND SETTLEMENT GAGES (Item No. 34)

(a). General. In the dam embankment the contractor shall furnish all material and install a system of piezometers and settlement gages complete as located and detailed on the drawings.

(b). Piezometer Gages.

(1). Material. Piezometer piping shall be made up of galvanized wrought iron pipe and type K annealed copper pipe meeting Federal Specification WW-P-444a and WW-T-799a respectively. Incidental brass pipe fittings shall be of standard manufacture.

(2). Installation. After the dam foundations have been stripped and prepared for the embankment fill but before fill operations have been started (except for the stilling basin piezometers) the piezometer pipes shall be placed in the positions shown on the plans. When the pipes of the spillway and embankment piezometers are in their final position a coarse sand filter bulb shall be placed at the bottom of each piezometer pipe as shown on the plans. The stilling basin piezometer pipe shall be installed in the screened gravel as indicated on the drawing. Vertical pipes shall then be extended progressively with the raising of the dam embankment in such a way that the tops of all pipes shall at no time be higher than eighteen (18) inches below the embankment surface at the time. Backfill around the pipes shall be compacted to a density equivalent to that of the surrounding material, and with extreme care so as not to disturb the pipes. Laying of pipe for the stilling basin piezometer shall be performed in the same manner and with the same restrictions specified for laying of the pipe. (See Paragraph TP-S, 5-07). Piezometers at the spillway shall be installed as detailed on the drawings. After completion, each embankment piezometer shall have its locations marked by a four inch by four inch (4"x4") white oak post five B.S.

(5) feet long set three (3) feet in the embankment. Buried portion shall be creosoted with two (2) brush coats of coal-tar creosote conforming to Federal Specification TT-N-561a, for "Wood-Preservative; Creosote (for) Brush and Spray Treatment". The top shall be given two (2) coats of white paint for exterior work as specified in Section 14. The number of the piezometer station, offset and elevation shall be painted in black on the post.

(c). Settlement Gages.

(1). Material. Galvanized wrought iron rods, cast iron pipe and cast iron cover shall conform to Federal Specifications QQ-I-686a, EWW-P-421, 150# Class and QQ-I-652 respectively.

(2). Installation. The gages shall be installed as shown on the plans in such a manner that at no time will the tops of the gage rods be higher than eighteen (18) inches below the top surface of the embankment at any time during construction of this embankment. Proper protection of the rods during construction will be the responsibility of the contractor. Upon completion of the final course of the dam embankment the final section of the gage shall be cut off as shown on the drawings, a brass cap installed and a cast iron pipe with cover shall be installed as shown on the drawings.

(d). Payment. Payment will be made at the contract lump sum price for Item No. 34 "Spillway, Stilling Basin and Embankment Piezometers and Settlement Gages" for the complete installation as shown. Payment under this item will include all costs of all material including post markers for embankment piezometers, and all necessary excavation and back-filling. Payment will not be made under any other items for any material furnished or any work done to make the installation complete except that sand will be paid for under Item No. 20.

(a). Scope of Work. Piezometer pipes in locations downstream of the dam embankment as shown on the drawings, shall be installed to depths shown or as directed by the Contracting Officer.

(b). Material. Pipe shall be one and one-half ($1\frac{1}{2}$) inch galvanized wrought iron conforming to the requirements of Federal Specification WW-P-441a.

(c). Procedure. Casing of three (3) inch minimum diameter shall be driven vertically by a suitable form of rig that will penetrate all materials encountered. Blasting will be permitted for the removal of boulders and cobbles. In order to determine the nature of the material encountered, two-(2") inch diameter "dry samples" shall be obtained at a maximum interval of ten (10) feet, or at each change of material, subject to the direction of the Contracting Officer. Dry samples shall be taken by driving an open end pipe or soil sampler into undisturbed material. Upon completion of the hole, the casing shall be cleaned out, and the one and one-half ($1\frac{1}{2}$ ") inch piezometer pipe placed inside the casing. Sand meeting the requirements of Paragraph TP-6-06 shall be used to backfill around the piezometer pipe in the sand stratum to replace the space occupied by the casing as the casing is being withdrawn. Sand shall be used from the bottom of the pipe to the underside of the glacial till stratum. The remainder of backfill from the underside of the glacial till stratum to the ground surface shall consist of fine impervious material placed to seal the hole against movement of ground water adjacent to the piezometer pipe. The casing shall be entirely withdrawn.

(d). Measurement and Payment.

(1). The quantity of piezometer pipe to be measured for payment shall be the number of linear feet of piezometer pipe placed.

The pipe will be measured in each case from the ground surface down to the bottom of the piezometer pipe. Holes abandoned with the approval of the Contracting Officer will be measured for payment; measurement being made from the elevation of the maximum penetration of the casing in the abandoned hole to the ground surface.

(2). Payment will be made at the contract unit price for Item No. 35, "Downstream Piezometers" and shall include all costs of furnishing and installing the piezometers as specified and indicated on the drawing. Payment under any other items of work in connection with installing downstream piezometer will not be made, except that sand will be paid for under Item No. 20.

TP-7-06. RELIEF WELLS (Item No. 36)

(a). General. Relief wells as detailed on the drawings shall be installed at locations shown or as directed by the Contracting Officer.

(b). Material. Piping shall be black or galvanized wrought iron pipe, as shown on the plans, conforming to the requirements of applicable Federal Specification WW-P-441a. Sand placed at the bottom of the well shall conform to the requirements of paragraph TP-6-06.

(c). Samples. In order to determine the nature of the material penetrated, it will be necessary to take samples frequently as the well driving progresses. The contractor shall provide all assistance to the Contracting Officer required to take samples of the material as required by the Contracting Officer.

(d). Procedure.

(1). The contractor shall drive casings with minimum diameter of eighteen (18) inches at the bottom in locations shown on the drawings or as directed by the Contracting Officer. Casings shall be driven to Elevation 610 or to the surface of bed rock whichever is higher. Material inside the casing shall be removed by washing or by any

other approved methods. After the casing has reached its final depth and all material inside the casing has been removed, sand shall be placed to form a bedding upon which to set the vertical drain pipe. The six (6") inch drainage well pipe with strainer section at the foot of the pipe, as shown on the drawings, shall then be inserted into and concentric with the casing. The space between the two (2) concentric pipes shall then be filled with the specified sand from the bottom of the well up to the underside of the natural blanket of impervious sandy and silty till as defined by the samples taken during the driving process. Fill material in the pipes above this line shall be impervious. The casing shall be withdrawn progressively as the filling is placed but in no case shall the bottom of the casing be at a higher level than the surface of the fill being placed. Each relief well shall be fitted with a toe connection near the top, the horizontal run of which shall be connected to the relief well collector pipe and the vertical run extended and capped with a screw cap as shown on the plans.

(e). Measurement and Payment.

(1). The quantity to be paid for will be the number of linear feet of relief well placed, measured from the surface of the ground to the bottom of the outside casing in its lowest driven position.

(2). Payment will be made at the contract unit price for Item No. 36, "Relief Wells" and shall include all costs for furnishing material and constructing the relief wells complete. Payment under any other items of work (except sand under Item No. 20) required to complete the work will not be made.

TP-7-07. RELIEF WELL COLLECTOR PIPE (Items Nos. 37a and 37b)

(a). General. Below the downstream toe of the dam embankment the relief well collector pipe and outfall drain shall be constructed of the size and to the lines and grades shown on the drawings.
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The portion of the toe drainage collector pipes which pass through the spillway walls shall be reinforced concrete pipe and included under this item.

(b). Material. The branch pipes shall be six-inch (6") bell and spigot non-reinforced concrete pipe and shall conform to the requirements of Federal Specification SS-P-371, for "Pipe, Concrete, Non-Pressure, Non-Reinforced and Reinforced". The main collector pipe and outfall shall be twelve-inch (12") bell and spigot reinforced concrete pipe conforming to the requirements of ASTM Specification C75-41 for "Reinforced Concrete Culvert Pipe".

(c). Excavation. Trenches shall be excavated as specified in Section 4.

(d). Pipe Laying.

(1). Pipe shall be carefully handled to avoid injury to the pipe. The pipe shall be carefully laid to lines and grades shown on the drawings or as directed by the Contracting Officer and shall be firmly bedded for its entire length. The pipe shall be jointed with mortar joints. Connections shall be made as shown on the plans. Any pipe damaged or out of line after laying shall be removed or relaid at no additional expense to the government.

(2). Mortar joints shall be made with mortar composed of one (1) part Portland Cement and two (2) parts sand. All mortar shall be made in such quantities that it will be used before attaining its initial set, and shall be thoroughly mixed by hand or in mechanical mixers. The minimum amount of water required for a workable mix shall be used. Pipe spigots shall be carefully centered and fully entered into the bells using jute or oakum gaskets soaked in cement grout to insure an equal joint space around the pipe. The mortar shall be thoroughly trowelled into the joints with sufficient overfill to hold

the mortar in the joint firmly in place. There shall be no shoulders or unevenness along the bottom half of the pipes and the interior of the pipe shall be cleaned after laying to remove dirt, mortar and other obstructions. Mortar joints shall be cured with a covering of wet burlap or damp earth. Pipe passing through concrete walls shall be rigidly held in place during concreting operations.

(e). Backfill. Backfill shall be placed carefully around pipe to avoid disturbing the pipe, in accordance with paragraph TP-5-07.

(f). Measurement and Payment.

(1). Measurement will be made of the number of linear feet of twelve-inch (12") pipe in place measured along the axis of the pipe, from end to end of the drain or to the inside wall of the manhole as shown on the drawings or as directed. Measurement for six-inch (6") pipe will be measured from centerline of relief well to centerline of main pipe.

(2). Payment will be made at the applicable contract unit price for Item No. 37a for Relief Well Collector Pipe - 6 inch Concrete and 12 inch R.C., and will include Item No. 37b for all costs for furnishing and laying pipe fittings and specials. Payment will be made for excavation at the applicable contract unit price for Item No. 6 or 7; backfill at the contract unit price for Item No. 16; and cement used in mortar at the contract unit price for Item No. 28.

TP-7-08. SIX-INCH ASBESTOS-CEMENT PIPE (Item No. 38)

(a). General. Asbestos cement pipe sleeves shall be installed to form weep holes and inspection well drains as shown on the drawings or as directed.

(b). Material and Installation. Asbestos-cement pipe shall be of the size shown on the drawings and shall conform to the applicable

requirements of Federal Specifications SS-P-351, for "Pipe; Asbestos-Cement". The pipe shall be installed in the concrete forms rigidly anchored so that they will not be displaced during the concrete pouring operations. Proper provisions shall be made so that no concrete enters the pipe. Pipe shall be inserted with ends exactly flush with finished concrete surface.

(c). Measurement and Payment.

(1). Measurement for payment will be the number of linear feet of asbestos cement pipe installed.

(2). Payment will be made at the contract unit price for Item No. 38, "Asbestos-Cement Pipe-6-inch".

TP-7-09. MANHOLE (Item No. 39)

(a). General. The contractor shall construct as shown on the drawings one complete manhole as part of the downstream drainage system.

(b). Material.

(1). Reinforced concrete pipe shall be bell and spigot pattern conforming to Federal Specifications SS-P-371, for "Pipe; Concrete, Non-Pressure, Non-Reinforced and Reinforced".

(2). Wrought iron ladder and cast iron manhole frame and cover shall conform to specifications listed in section TP-7-01(b).

(3). Common brick shall be new of the best quality, well burned and hard throughout, regular and uniform in size and shape and of compacted texture, meeting the requirements of Federal Specification SS-B-656 for "Brick; Building (Common) Clay", Grade H. Sample of the bricks the contractor proposes to use shall be submitted for the approval of the Contracting Officer.

(4). All mortar used in the construction of the manhole shall be in the proportions of one (1) part Portland cement to two(2) parts sand. The mortar may have just enough hydrated lime mixed in it,

to make it workable but the quantity of lime shall not exceed fifteen (15%) percent of the quantity of cement.

(c). Construction. The concrete pipe shall be firmly bedded in mortar placed upon the concrete base slab, with the mortar fillet as shown on the plans. The concrete pipe shall be laid true and plumb as shown on the plans and all joints shall be completely filled with mortar. Cutting of the concrete pipe to admit laterals shall be neatly done and patched smooth with mortar after the joint is made. Ladders shall be supported and anchored as shown on the plans. The brick work shall be thoroughly bonded to the concrete pipe through a well laid mortar bed in the top pipe bell.

(d). Payment. Payment will be made at the contract lump sum price for Item No. 39 "Manhole" and shall include all costs for furnishing labor and materials and building the manhole, complete, except that the wrought iron ladder, plank bracket and manhole cover and frame will be paid for under Item No. 31. Excavation will be paid for under applicable Items Nos. 6 and 7. Backfill will be paid for under Item No. 16.

SECTION 8 - EQUIPMENT (ITEMS NOS. 40 to 43, INCLUSIVE)

TP-8-01. MONORAIL HOIST (Item No. 40)

(a) General.-- The contractor shall furnish and install, on the monorail "I" beam in the equipment building, one 2-ton monorail trolley with ball bearing wheels similar and equal to Richards-Wilcox Company No. 925-2, and a 2-ton spur geared chain hoist similar and equal to "Budgit Chain Block" as manufactured by Manning Maxwell & Moore Inc.

(b) Data.-- The hoist shall be one 2-ton spur geared chain hoist, high speed type, meeting the following requirements:

Minimum distance between hooks	Not over 21"
Hand chain overhaul to lift load one foot	Not over 45 feet
Hand chain pull to lift full load	Not over 105 lbs.
Lift required	14 feet
Distance between bottom of loop on hand chain and top hook	Approx. 7 feet

(c) Payment.-- Payment for furnishing and installing complete one 2-ton monorail trolley and hoist as specified, will be made at the contract lump sum price for Item No. 40, "Monorail Hoist."

TP-8-02. GASOLINE-ELECTRIC STANDBY UNIT (Item No. 41)

(a) General.-- The contractor shall furnish and install complete one (1) fully equipped gasoline-electric generating set in the location in the equipment house indicated on the drawings.

(b) General Description.-- The unit shall consist of a gasoline engine direct connected through a flexible coupling to a synchronous type generator with direct connected or V-belt driven

exciter all mounted on a common cast iron or structural steel base. The generator unit shall be for three-phase, 4-wire, 60-cycle, alternating current service at 120/208 volts and shall have an output rating at 31.25 KVA at 80% power factor. The engine shall be water cooled. The unit shall be equipped with a storage battery, electric starting motor, detachable hand crank and all other appurtenances necessary for complete installation.

(c) Gasoline Engine.

(1) General.- The gasoline engine for the standby unit shall be the product of a reliable manufacturer who can show experience in successful manufacture of the type specified for similar duty. The engine shall be of the four (4) cycle type with four (4) or more cylinders. It shall have a published continuous speed rating of not less than eighteen hundred (1800) rpm and the maximum published continuous horsepower of the engine shall be not less than fifteen (15) percent greater than that required at full output of the generator at eighteen hundred (1800) rpm. The engine shall operate without serious detonation with a commercial grade of gasoline having an octane rating between sixty-five (65) and seventy (70).

(2) Crank Case.- The crank case shall be of cast iron, strongly ribbed, and of proper construction to facilitate inspection and adjustment of all bearings and other parts.

(3) Cylinder Blocks.- The cylinder block shall be high grade nickel-chrome iron alloy cast integrally with the crankcase or may be cast separate from the crankcase in one (1) piece or in pairs of cylinders. Cylinder blocks may be cast of grey iron with removable alloy cylinder sleeves.

(4) Pistons.-- Pistons shall be of light weight cast iron of suitable alloy and of such construction as to provide uniform expansion of the piston skirt. Each piston shall have at least four (4) rings, three (3) above the piston pin and one (1) below. Piston pins shall be made of hardened steel accurately ground and securely locked in place.

(5) Crank Shaft.-- The crank shaft shall be made of one (1) piece of heat-treated, alloy, forged steel substantially designed to withstand the most severe operating conditions. It shall be dynamically and statically balanced and all journals shall be surface hardened, ground and polished. The crank shaft shall be drilled to provide oil feed from the pressure system to the connection rod bearings. Main bearings shall be precision type, replaceable bronze or steel, backed, lined with babbitt or other proven bearing alloy.

(6) The Cam Shaft.-- The cam shaft shall be of high grade, polished, heat-treated steel with integral cams.

(7) Connecting Rods.-- The connecting rods shall be of high grade forged steel properly heat treated. Bearings shall be precision type, replaceable, bronze or steel backed, lined with babbitt or other proven bearing alloy. Connecting rods shall have a center to center dimension of at least 1.85 times the engine stroke.

(8) The Fly Wheel.-- The fly wheel shall be of high grade iron or steel and shall be statically and dynamically balanced. It shall be constructed to withstand the centrifugal forces produced at double the governed speed of the engine and shall be securely attached to the crank shaft on the engine side of the flexible coupling.

(9) Valves.-- The valves shall be of special heat resisting steel and shall be accurately fitted and ground to fit the valve seats and shall be quiet in operation. Valve guides shall be replaceable. The valve train shall be quite at all engine speeds. Exhaust valves shall seat on special heat resistant alloy inserts.

(10) Oil Pump.-- A positive displacement, gear-driven pump shall supply oil under pressure to the main bearing, cam shaft bearings and connecting rod bearings. Oil from the pump system shall be piped to the valve operating mechanism and timing gears. The pump shall be readily accessible and removable without dismantling the engine. An oil pressure gage shall be installed on the control board. A cartridge type oil filter with safety bypass valves shall be provided and installed on the engine. A safety oil pressure ignition cutoff switch shall be provided.

(11) Fuel System.-- The engine shall be equipped with carburetor, fuel pump, gasoline filter and flame arrestor, all mounted on the engine, and piping to provide fuel to the carburetor from the gasoline tank. The carburetor shall be of latest design and shall be equipped with choke air filter, flame arrestor and suitable connection for drain back to the storage tank. The engine driven fuel pump shall be of the diaphragm type and shall be suitable for lifting the gasoline twelve (12) feet to the carburetor from the gasoline tank twenty-five (25) feet distance. This fuel pump shall be readily removable from the engine. The engine shall also be equipped with a hand operated fuel pump and relief valve for priming the fuel system. Connections to the

gasoline lines shall be made with flexible seamless bronze hose with woven wire protection and packless connections. The entire system shall conform to the requirements of the Underwriters' Laboratories.

(12) Ignition and Starting System.— The ignition system shall be of the magneto type with impulse coupling. The magneto shall have helical gear drive or shall be direct connected to engine cam shaft or accessory shaft. Chain or belt drive will not be accepted. A heavy duty cranking motor shall be provided for starting the engine. The cranking motor shall be controlled by a magnetic switch. The motor shall be capable of cranking the engine at suitable speed to insure starting of the engine at freezing temperatures. Suitable provision shall be made to prevent operation of the engine cranking motor except when the spark control lever is in full-retard position. A storage battery shall be provided capable of continuously cranking the complete unit under operating conditions for a period of three (3) minutes with an engine room temperature of thirty-two (32) degrees F. with the engine crank case containing oil of the viscosity recommended by the manufacturer. The battery shall have a special plate construction for severe or unusual conditions. Each positive plate shall be composed of multiple insulated containers filled with active materials, the containers to run vertically, horizontally, or diagonally to permit free passage of electrolyte from one face of the plate to the other. Each container shall be slotted or perforated to permit diffusion of the active electrolyte into the containers. The electrolyte shall be of the low gravity type with

a specific gravity of 1.20 to 1.22. The battery shall conform to the specifications for United States Government award by the Treasury Department Procurement Division, Branch of Supply for lead-acid storage batteries, class 17, Item B-8630. A shelf with a suitable acid resisting lead tray shall be provided on the engine base for mounting the battery. A charging generator is not required for the unit.

(13) Governors.-- A governor of the non-hunting type similar and equal to type SG-9 manufactured by the Woodward Governor Company shall provide a speed regulation within three (3) percent of the normal operating speed at eighteen hundred (1800) rpm from three-quarters ($3/4$) load to full load. The speed variations at any one continuous load shall be not more than one and one-half ($1-1/2$) percent from the normal operating speed of eighteen hundred (1800) rpm. The engine shall be provided with an automatic ignition cutoff switch that will slow down the engine when the engine speed exceeds that normally controlled by the governor. The cutoff switch shall be adjustable and provided with manual reset.

(14) Exhaust Manifold.-- The exhaust manifold shall be a close grained gray iron casting, and provided with suitable flange connections. A flexible steel exhaust pipe shall be provided.

(15) Exhaust Silencer.-- An exhaust silencer shall be provided and piped as shown on the drawings. The silencer shall be of corrosion resisting metal and shall be similar and equal to the model MUI manufactured by the Maxim Silencer Company or the

equivalent silencer by the Burgess Battery Company. A two-inch (2") insulation similar and equal to Keasbey and Mattison "Hy-temp," Johns-Manville "Super-X" and Carey "Hy-temp" with an eighteen (18) ounce canvas jacket shall be provided for exhaust pipe assembly installation as shown on the drawings. A suitable slip tight expansion joint shall be installed in the exhaust system as shown on the drawings.

(16) Cooling System.— The engine shall be water cooled by means of a radiator type, copper fins and tubes, cooling system, which shall maintain the temperature of the cooling water at engine full load condition at its hottest point in the engine water jacket at or below one hundred eighty (180) degrees F, with an ambient air temperature of one hundred (100) degrees F. The radiator shall have a neat pressed steel or cast iron shell. The cooling water shall be circulated by means of a centrifugal pump equipped with accessible packing glands and with the pump shaft provided with graphite bronze bearings to eliminate the need of lubrication. The fan shall be driven by "V" belt drive with provision for adjustment. A thermostatically controlled valve shall be provided between the radiator and the engine to prevent any appreciable circulation between the radiator and the engine until the temperature of the cooling water has been raised to about one hundred forty (140) degrees F. There shall be provided a switch in the ignition circuit which shall open the circuit and stop the engine when the temperature of the water rises above one hundred eighty (180) degrees F. The cooling system shall be filled with a thirty percent (30%) solution of ethylene glycol containing a rust inhibitor and clear potable water.

(17) Gasoline Storage Tank and Pipe.-- A one hundred fifty (150) gallon gasoline storage tank together with filter, supply, drain and pipe shall be furnished and installed as shown on the drawings. Gasoline tanks shall be of welded steel construction and shall bear the approved label of the Underwriters' Laboratories. All gasoline piping shall be of hard copper tubing Type L, conforming to Federal Specifications WW-T-799a for "Tubing; Copper, Seamless (for Use With Soldered or Flared-Fittings)," installed with flared brass fittings. The valve on the suction line inside the gasoline tank shall be of the double poppet type similar and equal to O.P.W. & F. Company No. 92. The vent pipe shall be wrought iron conforming to Federal Specification WW-P-441a for "Pipe; Wrought-Iron, Welded, Black and Zinc-Coated," with malleable iron fittings conforming to Federal Specification WW-P-521b, for "Pipe; Fittings; Malleable-Iron (Screwed), 150-Pound." The gasoline gage shall be installed on the wall in the engine room. The gage shall indicate the amount of gasoline in the storage tank and shall be of the automatic, remote, reading type similar and equal to the manufacture of the Liquidometer Corporation of Long Island City, New York. It shall be float operated, the motion of the float operating against a bellows of a closed hydraulic system and the system shall be filled with a liquid for the purpose of transmitting the motion of the float to the indicator bellows. The indicator shall be installed in a protecting case not less than six (6) inches square and provided with a scale graduated to one hundred fifty (150) gallons. The flexible hydraulic tubing for connecting the indicator with the float

mechanism shall be protected by a metal armor. The connection between the gasoline tank and the connecting line shall be protected by a structural steel box of suitable size. The tank shall be painted in accordance with Section 14. All piping shall be tested before covering.

(18) Instrument Panel.-- A neat metal panel board shall be installed on the engine with the following instruments mounted thereon:

Tachometer

Main Oil Line Pressure Gage

Ammeter

Water Temperature Gage

Starting Motor Push Button Switch

(19) Tools.-- One (1) set of special wrenches, and tools necessary to fit all bolts, nuts and screws used on the engine and a grease gun if required shall be provided and mounted in a suitable compartment.

(20) Flexible Coupling.-- The flexible coupling shall be of an approved type all metallic and shall be provided with a suitable guard. The coupling shall be capable of transmitting three hundred percent (300%) of the normal operating torque of the engine.

(21) Lubricants.-- The engine shall be filled to manufacturer's recommended level with a high grade lubricating oil made of paraffin base crude and of recommended viscosity. Two (2) copies of the manufacturer's instruction book and repair parts list shall be furnished.

(d) The Generator.--

(1) The generator shall be of the standard rotating field synchronous type having the rating specified in paragraph TP-8-02(b). The generator shall operate continuously at full rated load and voltage with a temperature rise in the cores and windings of not more than fifty (50) degrees C above an ambient temperature of forty (40) degrees C. The generator shall be a reliable manufactured type and model of a make that has been regularly manufactured for at least five (5) years. The generator shall conform to the standards of the American Institute of Electrical Engineers, and the National Electrical Manufacturers Association.

(2) The stator and the rotor windings shall be insulated with Class "A" insulation and in addition, an insulation known in the trade as "Dye House" insulation. The armature terminals shall be located as shown on the drawings and shall be housed in a terminal box with a removable cover to which conduit may be readily connected from below.

(3) The generator shall be provided with two sleeve bearings of ample size. The bearings shall be of phosphor bronze or bronze and babbitt lined and shall be properly self-lubricated by oil rings extending into an oil reservoir.

(4) Slip rings shall be of bronze or brass. Brush holders shall be of rugged construction marine type and shall be provided with an adjustable tension spring which can be adjusted while the machine is in operation. All ferrous metals shall be corrosion resisting or shall be suitably rust proofed.

(5) The exciter shall be direct or V-belt connected to the generator. The exciter shall be shunt wound and of sufficient capacity to afford proper excitation to the generator field coils at one hundred fifty percent (150%) of the generator rating. The exciter voltage rating shall be one hundred twenty-five (125). A rheostat shall be furnished for the exciter field and shall be of the rotary type suitable for mounting on the back of the power switchboard with the controls extending through the front of the switchboard.

(e) Design Drawings.-

(1) The detailed design of the standby unit shall be such that all working parts will be readily accessible for inspection and repair and can be readily replaced.

(2) Before purchasing the gasoline-electric standby unit, the contractor shall furnish drawings and specifications for the proposed standby unit for approval. The drawings will include the engine, generator, exciter, and all accessories with dimensions of concrete base for mounting. Accessories shall be listed on the drawings with the catalog number with the name of the manufacturer and shall be accompanied by cuts and the manufacturers specification for the accessories all properly numbered to agree with the list as shown on the drawings.

(f) Installation.- All work shall be neatly and accurately done and shall be in accordance with the highest standards of practice for the equipment of the type to be furnished. The engine and the generator shall be accurately aligned on the bed plate and securely attached thereto. Provision shall be made for

lifting the engine and generator either separately or as an entire unit by crane. The unit shall be erected accurately to line and level on the concrete base required therefor, directly secured and every detail of the work of installation shall be done in a thorough workmanlike manner.

(g) Inspection and Tests.-

(1) Shop Tests.- The combined unit shall be tested by operation at the works of the manufacturer for not less than eight (8) hours in the presence of an authorized representative of the contracting officer. Under this test and for any test load specified, there shall be no evidence of serious vibration. The valve setting and governor adjustment shall be checked with the combined unit operating under various loads in the speed range specified. A typewritten record of all shop tests including all observation results and graphs shall be certified and submitted to the contracting officer in triplicate as soon as practicable after completion of the tests.

(2) Final Acceptance Tests.- Final acceptance tests and trials of the gasoline electric generator set shall be made by the contractor upon completion of the installation. The test shall cover a period of twelve (12) continuous hours during which period the combined engine and generator unit shall provide normal rated output. If during the tests, any imperfections of equipment, workmanship or arrangement are found, proper correction shall be made and the entire test or any portion of it as directed by the contracting officer shall be repeated. In order to secure approval in these tests, the gasoline electric unit shall operate smoothly

without undue noise or vibration; the governor shall maintain an even speed at all loads and the carburetor shall function without flooding and without back-firing; the electrical equipment shall operate without any indication of excessive heat and shall maintain an even voltage at all loads. Such additional tests as may be necessary may be required by the contracting officer. All final acceptance tests shall be made in the presence of an authorized representative of the contracting officer.

(h) Painting.-- Painting shall be done in accordance with Section 14.

(i) Payment.--

(1) Payment for furnishing and installing the gasoline electric standby unit will be made at the contract lump sum price for Item No. 41, "Gasoline-Electric Standby Unit" and shall include the complete unit with gasoline tank, piping, all accessories and concrete base.

(2) Partial payment of fifty percent (50%) of the contract price will be made after the equipment has been shop tested to the satisfaction of the contracting officer and delivered at the site of the work, and the remainder of the contract price will be paid after installation and completion of the field tests to the satisfaction of the contracting officer.

(3) All costs for testing, except for the Government's representative, shall be included in the contract price for Item No. 41.

TP-8-03. INSTALLATION OF EQUIPMENT FURNISHED BY THE GOVERNMENT (Item No. 42).--

(a) Scope of Work.-- The contractor shall install the

following equipment to be furnished by the Government:

Conduit Liners

Service and Emergency Gates

Gate Bonnets and Bonnet Covers

Hydraulic Hoists

Gate Hangers

(b) Drawings.-- After purchase of the equipment by the Government, one (1) complete set of assembly and erection drawings prepared by the manufacturer will be furnished to the contractor. Details shown on the contract plans are furnished for information only as to type of equipment to be furnished. In case of variations between the contract drawings and the final approved drawings of the equipment furnished, the final approved drawings shall govern.

(c) Installation.--

(1) The contractor shall install six (6) sets of slide gates as indicated on the drawings. Each set shall consist of one (1) service slide gate, one (1) emergency slide gate (each with a hydraulic hoist), upstream and downstream units of conduit liner and two (2) gate hangers. The gates, bonnets, bonnet covers, hydraulic hoists and conduit liners will be shop assembled and match marked at the plant of the manufacturer before shipment. All flanges will be drilled and all bolts fitted.

(2) The contractor shall unload from cars, haul to the site of the work, protect and store equipment furnished by the Government. The contractor shall thoroughly clean all parts, remove all rust, dirt, etc., clean all holes and grooves for

lubrication and examine all enclosed chambers and passages to make sure they are free from foreign material. Proper precautions shall be taken by the contractor to protect all finished parts liable to damage in handling. Stillson wrenches, cold chisels or other tools likely to cause injury to the surfaces of rods, nuts or other parts shall not be used in assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to over stress threads by use of excessive force. Driving or drifting of bolts will not be allowed.

(3) Gates, bonnets and conduit liners shall be held rigidly in place and true to lines and grades during placing of concrete and shall be adequately braced to prevent distortion due to pressure exerted in concreting operations. The conduit liners shall be set and grouted in a recess in the conduit slab and then shall, together with the gate bonnets, be cast as an integral part of the walls and roofs of the conduit. Concrete shall be thoroughly spaded around the liners and bonnets to obtain sound concrete free from voids. After installation, all conduit liners and accessible portion of the gate bonnet shall be tested with hammers to detect possible voids in concrete. If voids are detected, grout shall be applied through grout holes located in the castings. If additional holes are required the contractor shall make the same and plug them with screwed plugs after grouting is completed. All plugs shall be ground flush with the surfaces of the castings.

(d) Tests.-- After the slide gates have been installed, the contractor shall make all necessary adjustments and test each gate by raising and lowering it five (5) times through its entire

normal range of operation. This shall be done to the satisfaction of the contracting officer, and the test shall be performed in the presence of an authorized representative of the contracting officer.

(e) Painting.-- The gate bonnet covers and hydraulic hoists shall be painted in accordance with Section 14.

(f) Payment.-- Payment for installation of conduit liners, gates, gate bonnets, bonnet covers, hydraulic hoists and gate hangers will be made at the contract lump sum price for Item No. 42, "Installation of Equipment Furnished by the Government," which price shall include payment for unloading and hauling from the point of delivery, storing, cleaning, installing, painting and testing.

TP-8-04. OIL PRESSURE SYSTEM (Item No. 43).--

(a) Scope of Work.-- The contractor shall furnish and install the oil pressure pumps and motors on an oil tank base, all piping, fittings, valves, gaskets, hangers, bolts, nuts and other accessories and do all work necessary to install a complete oil pressure system for hydraulic operation of service and emergency gates as indicated on the drawings or as directed by the contracting officer.

(b) Description.--

(1) Piping.-- All piping and pipe fittings shall be installed as shown on the drawings. Piping shall be seamless steel pipe and shall conform to the requirements of Federal Specification WW-P-406 for "Pipe; Steel and Ferrous-Alloy (for) Ordinary Uses, (Iron-Pipe Size)," Type I, and pipe fittings shall be forged steel two thousand-pound (2,000 lb.) class, unless otherwise indicated on the drawings. All unions shall be ground joint type

forged steel two thousand-pound (2,000 lb.) class. Pipe threads shall conform to Federal Specification GGG-P-351a for "Pipe-Threads; Taper (American-National)." Threading shall be done, insofar as is practicable, in the shop of the pipe manufacturer by experienced operators using power tools. The contractor shall furnish the contracting officer with new ring gages of one-inch (1") and one and one-half-inch (1-1/2") American National taper pipe thread sizes for use of the Government inspectors. Each field cut thread shall be clean cut to gauge within the tolerance permitted by the specification. The contractor shall furnish the contracting officer with a certified statement from the pipe manufacturer that shop cut threads conform to the specifications. The contracting officer may check in the field any or all shop cut threads for conformance with the specifications. Pipe thread compound shall be similar and equal to Grinnell Fig. 1698. The use of pipe compound is permitted principally for lubrication purposes and is not to be considered as a medium for making tight joints. The quality of the threads specified should, without pipe compound, insure tight joints. Pipe fitters employed in this work shall have had considerable experience in installing high pressure hydraulic systems.

(2) Oil Pumping Units.- Each oil pumping unit shall consist of a high pressure rotary type pump direct connected to an electric motor. The pump and motor shall be mounted on a common base, which serves as the expansion tank, and direct connected by means of a suitable all metal flexible coupling. The oil pumping units shall be of such size that they can readily be accommodated in the space provided and shall be mounted in opposed tandem with

both intakes on one (1) side of the longitudinal center line and both discharges on the opposite side as shown on the drawings.

a. The oil pump shall be a rotary pump of herring bone gear type similar and equal to Northern Pump Company, Minneapolis, Minnesota, Series 4000 or hydraulically balanced helical screw type similar and equal to Delaval-IMO manufactured by Delaval Steam Turbine Company, Trenton, N. J. with a single stuffing box. They shall be the products of reputable manufacturers who have regularly engaged in the manufacture of similar pumps of proved performance. The design and construction of the pumps shall be such that particles of scale and other foreign material not removed from the oil by suction strainer using a No. 20 mesh screen may pass through the pump unit without impairing the pump efficiency or causing abnormal wear.

b. Each pump shall be capable of delivering a smooth uniform flow of oil at a rate of not less than nine (9) nor more than eleven (11) gallons per minute against a maximum pressure of five hundred (500) pounds per square inch with a rotor speed of eleven hundred fifty (1150) rpm.

c. The pump casing shall be steel or cast iron of ample strength for the required service. The suction and discharge parts shall be integral with the pump casing and either threaded for connection with a one-inch (1") steel pipe or furnished with companion flanges threaded for connection with a one-inch (1") steel pipe.

d. All parts of the rotary element shall be of high strength heat treated alloy steel.

e. Shaft bearings shall be of the ball or roller type arranged for internal lubrication except that the bearings for a balanced screw type may be bronze bushed.

f. The motors for the pumping units shall be squirrel-cage, induction type designed for 208-volt, 3-phase, 60-cycle service and equal and similar to General Electric Company type K. The observed temperature rise of the cores and windings shall not exceed forty (40) degrees C above the ambient temperature when the motor is operated continuously under full load at rated voltage and frequency. The motors shall be capable of developing sufficient power to operate the pump at the rated capacity against the maximum working pressure but in no case shall the rated horsepower of the motors be greater than five. The synchronous speed of the motor shall be twelve hundred (1200) rpm. Motors will be started at full voltage by means of a magnetic starter.

g. All top bearing surfaces of the bed plate shall be machined. Positive and permanent alignment of the motor and pump shall be secured with suitable fitted bolts or dowels.

h. The contractor shall furnish a complete set of maintenance tools for the oil pumping units.

i. Shop Tests.- Each pump shall be subjected to a hydrostatic pressure test of seven hundred fifty (750) pounds per square inch. Sufficient tests shall be made at the various load conditions up to one hundred twenty-five percent (125%) load to accurately establish performance curves for the motors. Each pumping unit shall be completely assembled in the shop and tested under conditions simulating as nearly as possible conditions which

will be encountered in actual service using oil conforming to the requirements of the oil to be used in the final operation of the pump. The pumps shall be tested against pressures of one hundred, two hundred fifty and five hundred (100, 250 and 500) pounds per square inch to fully develop pressure-capacity curves for the pumping units to demonstrate compliance with all the requirements of these specifications.

(3) Oil Tank.-- The contractor shall furnish and install an oil tank of all welded steel construction complete with all appurtenances and fittings as indicated on the drawings.

(4) Pipe Supports.-- The pipe supports shall be furnished and installed as indicated on the drawings.

(5) Valves.-- Valves, cocks and other fittings of sizes, type and quality shown on the drawings shall be furnished and installed as indicated.

(6) Hydraulic Gages.-- The contractor shall furnish and install seven (7) hydraulic gages as shown on the drawings. Gages shall be four and one-half (4-1/2) inches in size with iron case and brass ring and shall be calibrated from zero (0) to one thousand (1000) pounds. Gages shall be of the heavy duty precision type similar and equal to Style AIH as manufactured by the Crosby Steam Gage and Valve Co., of Boston, Mass.

(7) Oil Supply.-- The contractor shall furnish and fill the system with oil conforming to the following requirements:

Gravity, A. P. I.

23 to 27

Flash Point (min)

365 degrees F.

Fire Point -(min)

410 degrees F.

S.U. Viscosity at 100 degrees F.	200 to 230
at 210 degrees F.	44 to 46
Pour Point (max)	Minus 20 deg. F.
Conradson Carbon	Less than 0.10
Neutralization Number	Less than 0.05

The quantity required to fill the system is approximately twelve hundred (1200) gallons. The contractor shall also furnish and place in the equipment room one (1) fifty-five (55) gallon drum of the same oil.

(c) Materials and Tests.-- The oil pump units, oil tank and all piping shall be installed in a workmanlike manner and in strict accordance with the drawings and these specifications.

After the installation above has been completed each gate shall be completely raised and lowered five (5) times and all necessary adjustments shall be made until the operation is satisfactory to the contracting officer. There shall be no leakage in the pipe system when the piping is subjected to a hydraulic pressure test of five hundred (500) pounds per square inch for two (2) sustained periods of thirty (30) minutes each conducted on different days.

(d) Parts List.-- The contractor shall furnish the contracting officer with a complete list in triplicate of all standard parts of the oil pumps, motors and accessories.

(e) Painting.-- The motors, pumps, tank and piping shall be painted as specified in Section 14.

(f) Payment.-- Payment for furnishing and installing the oil pressure system complete including pump, motors, oil tank, piping, fittings, valves, gaskets, pipe supports, oil, concrete base and anchor bolts will be made at the contract lump sum price for Item No. 43, "Oil Pressure System." All costs of tests, except for the Government's representative, shall be included in the contract lump sum price for Item No. 43.

SECTION 9 - ELECTRIC POWER, LIGHTING AND TELEPHONE
SYSTEMS (ITEM NO. 14)

TP-9-01. SCOPE OF WORK

The work provided for under this section consists of furnishing and installing electrical power and lighting system, complete and ready for operation, including all conduit, equipment, devices, wiring, grounding, provisions for telephone service and other components, all as shown on the drawings and as hereinafter specified.

TP-9-02. STANDARD RULES AND SPECIFICATIONS

(a). General. Unless otherwise specified, all electrical materials, workmanship and tests shall be in conformity with the current standard rules, regulations, and specifications of the following authorities:

(1). National Board of Fire Underwriters (205 East Ohio St., Chicago, Illinois).

(2). National Electrical Manufacturers Association (1420 Lexington Avenue, New York, N. Y.).

(3). American Institute of Electrical Engineers (33 W. 39th Street, New York, N. Y.).

(4). Bureau of Standards (National Electrical Safety Code) (Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.).

(5). American Society for Testing Materials (260 South Broad Street, Philadelphia, Pa.).

(b). Equipment. Equipment for the same, similar or allied services shall be of the same manufacture and type, and when of the same rating shall be interchangeable. All equipment shall be designed to require a minimum number of spare parts.

TP-9-03. GAUGES

Gauge of wire, cable, and sheet metal specified herein and noted on the drawings is American Wire Gauge (A.W.G.) (Brown & Sharpe) for electric wire and cable, and United States Standard Gauge (U.S.S.) for sheet metal, unless otherwise noted.

TP-9-04. WIRE AND CABLE.

(a). General. All wire and cable shall be of the sizes and number of conductors as noted on the drawings. Incoming power wires and cable shall be rubber insulated for five thousand (5000) volt service and shall conform to the requirements of Federal Specification J-C-121, for "Cable and Wire; Rubber-Insulated (For) Other than Building Purposes, Superaging-Grade (0 to 8000-Volt Service)". Power distribution, lighting, and control wires and cables shall be rubber insulated for six hundred (600) volt service, and shall conform to the requirements of Federal Specification J-C-103 for "Cable and Wire; Rubber-Insulated, Building-Type, (0 to 5000-Volt Service)". For the purposes of this specification, the incoming power wiring shall include the entire twenty-three hundred (2300) volt system only. Power distribution, lighting, and control wiring shall include the entire 120/208 volt system and any voltages below these ratings. All stranding shall be standard unless otherwise noted. Insulation thicknesses, and test voltages shall conform to the applicable specification for the circuit voltages shown on the drawings or specified herein.

(b). Copper Wire for Grounding Cable. Copper wire for grounding cable shall conform to Specification B-8-44 of the American Society for Testing Materials for "Concentric-Lay-Stranded Copper Conductors; Hard, Medium-Hard or Soft" and shall be "Soft" grade. Sizes shall be No. 4 stranded unless otherwise noted on drawings.

(c). Copper Bar. Copper bar shall conform to Federal Specification QQ-C-501a for "Copper; Bars, Plates, Rods, Shapes, Sheets and Strips".

(d). Wire and Cable Shipment. All wire and cable shall be shipped on reels or in coils, plainly marked for complete identification, including wire or cable size and type, number of conductors, length, weight, thickness and character of insulation and name of manufacturer. All lead-covered wire or cable shall have ends sealed with lead solder before shipment.

TP-9-05. CONDUIT AND CONDUIT FITTINGS

(a). Rigid Metal Conduit. Rigid metal conduit, unless otherwise indicated, shall be hot-dip galvanized or sherardized and enameled inside and outside, and shall conform to Federal Specification WW-C-581a, "Conduit; Steel, Rigid, Zinc-Coated".

(b). Non-Metallic Conduit. Non-metallic conduit shall be "asbestos-cement" or "bituminized fiber" type, as manufactured for use with concrete encasement and shall conform to Federal Specifications W-C-571 for "Conduit and Fittings; Asbestos-Cement (for) Electrical Purposes" and W-C-581 for "Conduit and Fittings; Fiber, Bituminized", respectively.

(c). Metal Conduit Fittings. Metal conduit fittings shall be galvanized, sherardized, or cadmium plated high test gray iron or malleable iron castings of type and size as noted on drawings. Approved type gaskets shall be furnished between joints.

(d). Flexible Metal Conduit. Flexible metal conduit shall be of the concave single-strip type, consisting of steel strips helically wound with tight seams so as to provide a smooth, even surface inside the conduit, and shall conform to the requirements of Federal Specification WW-C-566, for "Conduit; Steel, Flexible", except that it may be galvanized, sherardized, or cadmium plated.

(e). Conduit Expansion Fittings. Conduit expansion fittings shall be of an approved water-tight construction of standard manufacture, designed so as to prevent damage to the cables and provided with an approved means to insure the electrical continuity of the conduit run.

(f). Outlet Boxes. Outlet boxes shall meet the requirements of Federal Specification W-O-821a, for "Outlet-Boxes; Steel, Cadmium or Zinc-Coated, with Covers and Accessories".

TP-9-06. RUBBER MATTING.

(a). Rubber matting for use in front of the switchboard shall conform to Federal Specification ZZ-M-81, for "Matting; Rubber (For Use Around Electrical Apparatus or Circuits Not Exceeding 3000 Volts to Ground)".

TP-9-07. LAMPS.

All lamps, except switchboard indicating lamps, will be supplied by the Government and installed by the contractor.

TP-9-08. CONDUIT INSTALLATION.

(a). Rigid Metal Conduit. Rigid metal conduit shall be furnished and installed complete with fittings, couplings, unions and all accessories necessary to provide a complete system, ready for installation of all wiring, fixtures and equipment as indicated or required for proper operation of the entire electrical system.

(b). Metallic conduit installation shall be made as shown on drawings. Ends of conduit shall be reamed to remove rough edges and burrs, and all joints between lengths of conduit, boxes and fittings shall be water-tight and tightly made to provide electrical continuity for a given system or run. Each run shall be inspected as soon as completed for electrical and mechanical continuity, water removed by swabs or compressed air, and capped or plugged. Conduits shall be kept closed except when working on run. Conduits designated as spares shall be terminated with couplings and brass plugs. Approved expansion joints, with jumpers for maintaining electrical continuity, shall be provided where required. Conduit connections to equipment subject to vibration shall be made with flexible conduit and approved connectors. Reinforcing steel shall not be cut but shall be bent where required to permit passage of conduit. Conduits crossing contraction joints shall be perpendicular to the plane of the joint for a minimum distance of twelve (12) inches on each side of the joint, and the expansion type fitting shown on drawings shall be employed at every crossing. Conduits and fittings shall be properly protected during construction against mechanical injury. Conduits shall be fastened to sheet metal enclosures with outside and inside locknuts and inside bushing.

Spacing of embedded conduits, unless otherwise dimensioned, shall allow two (2) inches minimum clearance between conduits to permit flow of concrete between them, and concrete shall be so placed as to eliminate voids around conduits. Concrete encasing duct runs as indicated on the plans shall conform to the requirements of Section 6 with a three-quarter-inch ($3/4$ ") maximum aggregate size. Where less than minimum spacing is indicated, concrete shall be puddled by hand. Exposed conduits shall be run in straight lines parallel to walls, beams or columns. Supports shall be provided for exposed conduit every five (5) feet for sizes smaller than one (1) inch, and every eight (8) feet for sizes one (1) inch and larger. Exposed conduits shall be supported one (1) foot or less from each termination point, and shall have one (1) point of each bend anchored. Supports shall be malleable iron, one-hole clamps bolted to expansion anchors for concrete mounting and two-hole straps for wood mounting. Screws shall be employed throughout for all conduit and equipment mounting on wood construction. The use of conduit unions in embedded work, and Erickson couplings in exposed work is approved, but use of running threads is prohibited. Standard factory bends shall generally be employed, unless special field bends are indicated. Field bends shall be made so that the internal diameter of the conduit is not materially changed, and the inside and outside protective coatings are not damaged. Heat shall not be employed in bending. Surface mounted boxes shall be set out from mounting surface so as to allow air circulation behind them. Embedded sheet metal boxes and frames shall be given one (1) coat of red lead paint on all surfaces prior to erection. Finish coats for exposed parts shall conform to general painting scheme of building.

(b). Non-Metallic Conduit. (1) Non-metallic conduit installation shall follow the applicable provisions of installation of metallic conduit. Tapered end of conduit shall be coated outside with asphalt base paint before making up joint. Completed joint shall be swabbed with asphalt base paint prior to envelopment in concrete. Approved end bells shall be provided to terminate all conduits entering manholes or buildings.

(2) Conduits shall be firmly anchored before pouring concrete to prevent floating. Conduit spacing shall be maintained uniform by use of precast spacers. Conduits shall be sloped to drain to manholes.

(c). Conduit System for Telephone. Conduits for a telephone system complete with all necessary fittings for installation of telephone wiring and equipment shall be installed as indicated on the drawings. Provision is made for extensions to future operator's quarters, if required, such extension to be under the direction of the Contracting Officer. Installation of telephone wiring and equipment is not required under this contract.

TP-9-09. GROUNDING SYSTEM

A grounding system shall be installed as indicated on the drawings. The provisions of the National Electrical Code shall be followed, except where specific details are shown on drawings or as amended herein. Ground connections shall be provided for all equipment frames and housings, metal cabinets housing electrical equipment, metal conduit and other equipment, as indicated on drawings. No ground taps smaller than No. 4 shall be employed. Conduits shall be grounded to metal cabinets and frames by use of grounding wedges

wherever possible, or by mechanical connectors and bolted connection. All connections between grounding conductors shall be made with mechanical connectors, and the entire joint then brazed. The use of soldered connections is prohibited. Exposed conductors shall be securely fastened to surfaces by one-hole clamps at intervals not exceeding five (5) feet. A driven ground system shall be installed as indicated on drawings.

TP-9-10. LIGHTING SYSTEM.

The lighting system shall be furnished and installed as indicated on the drawings, and shall be complete and ready for operation with all accessories as required. Circuits shall be identified at the panelboards and a directory furnished for each panelboard.

TP-9-11. MAIN INCOMING FEEDER.

(a). General. Care shall be exercised during the pulling-in of the primary feeder cable. The conduit shall be rodded and mandrelled to remove all obstructions before pulling cable. Guides shall be used at entrance points of conduit and personnel shall be posted at these points to insure proper transit of cable without damage to sheath. Soapstone or talc only shall be used as cable lubricant. The bending radius during installation and the final installed radius at any bend shall not be less than ten (10) times the cable diameter. Training of cable in manholes shall permit creepage for temperature changes by introduction of slack.

(b). Terminations. Cable installation in potheads shall be made by qualified workmen under such conditions as will not permit entrance of moisture into cable. Compounding of potheads shall be made in such manner as to avoid the formation of voids in the compound.

The pothead body shall be warmed to prevent chilling of compound during pouring. Temperatures and procedures recommended by the compound and pothead manufacturers shall be followed.

(c). Insulation. All connections and terminations shall be made up to provide insulation equivalent to the cable insulation by use of sufficient layers of insulating tape. Each tape layer shall be wound half-lapped. After application of the final layer of insulating tape, two (2) layers of friction tape shall be applied half-lapped, and the entire joint shall be painted with two (2) coats of high grade air-drying varnish.

TP-9-12. CABLE AND WIRE DESIGNATIONS.

All cables and wires shall be identified at each manhole by means of permanently legible tags affixed to cables or wires by non-rusting metal straps or other suitable method. Circuits entering and leaving switchboard shall be identified in similar manner. Samples of tags and fasteners shall be approved by the Contracting Officer.

TP-9-13. MATERIALS, EQUIPMENT AND INSTALLATION

All materials and equipment supplied and installed shall be new and of high-grade workmanship. Provisions of the appropriate Federal Specification shall be met wherever applicable. Where Federal Specifications do not apply, the N.E.M.A. Standards shall be met. Installation methods and workmanship shall conform to recognized practices.

TP-9-14. SWITCHBOARD.

(a). General. A manually operated, dead front, safety, metal enclosed cubicle type switchboard of all steel construction shall be furnished and installed in accordance with the drawings. It shall consist of two (2) panels, each with its own self-supporting frame work, formed and welded of structural steel shapes, all mounted on a common base consisting of two (2) six-inch (6") 8.2 pound channels. Assembled switchboard shall be enclosed with stretcher-levelled sheet steel covers not less than one-eighth ($1/8$) inch thick on all sides and top. Covers shall be removable, normally held in place with countersunk oval head machine screws, and equipped with the necessary ventilating louvres. All panels shall be of sectional type construction. Each panel shall consist of frame work made of steel angles, jig welded to provide for accurate alignment of the panel front sections and the various circuit breakers. The circuit breakers and switches shall be supported at the rear of their respective sections by horizontal cross-members bolted to the steel frame work. Separate cross-members of the steel frame shall be formed and located to support properly the removable front panel sections to provide for inspection and maintenance of the circuit breakers from the front of the switchboard. The front panel sections shall be made of one-eighth-inch ($1/8$ ") stretcher-levelled steel, having all four (4) sides bent up to insure rigidity and neatness of appearance. All exposed surfaces shall be bonderized and after the customary priming process, shall be finished in velvety dull black.

Interior surfaces shall be given two (2) finish coats of a gray or light colored paint, in accordance with the requirements of Section 14.

(b). Wiring. The switchboard shall be completely wired by the manufacturer so as to be ready for operation when the incoming power service and utilization connections are made by the contractor.

(c). Copper Parts. All copper connections, including the bus bars, shall be of rectangular bar of such dimensions that the temperature rise under full load will not exceed thirty degrees (30°) C. Bus bars, where necessary for cross panel connection, shall be furnished complete with the necessary insulating supports. The bus structure shall be of rigid construction, able to withstand without deformation the stresses incident to the maximum short circuit current which may be encountered on the system. Location and arrangement of bus bars and interconnections shall be such as to permit easy and safe connections of the various feeder cables. Bolted joints shall be used throughout and all contacts shall be silver plated. All bolts used for the connection shall be equipped with lock washers. Approved solderless terminals shall be furnished on the various circuit breakers and switches to terminate the incoming and outgoing cables.

(d). Air Circuit Breakers. Air circuit breakers shall be of the voltage and current rating indicated in Paragraph TP-9-14(k) and shall conform to the requirements of Federal Specification W-P-131a for "Panelboards; Equipped with Automatic-Circuit-Breakers."

(e). Switches. Transfer switch shall be dead-front, designed for front-of-board operation and back-of-board mounting, and shall conform to the requirements of Federal Specification W-S-871 for "Switches; Knife, Open-Type, Front-and-Rear-Connected."

(f). Fuses. Fuses for six hundred (600) volts or less shall conform to Federal Specification W-F-803a for "Fuses; Cart-ridge, Inclosed, Renewable (Fusible Links Not Separately Inclosed), and Renewal-Links Therefor," Type "II". The voltage and current ratings shall be as specified or required.

(g). Indicating Instruments. Indicating instruments (meters) for switchboard mounting shall be standard manufactured products of the rectangular flush type with a dull black finish to match the switchboard. The moving elements shall have high torque, be supported on jewel bearings and shall be capable of withstanding heavy instantaneous overloads. They shall be well damped, and shielded from external magnetic fields. Scales shall be direct reading, of the range required or indicated, designed to permit correct and ready reading within an angle of forty-five (45) degrees from the normal and shall carry the instrument data, all as approved by the Contracting Officer. The pointer shall have zero (0) adjustment by means of a screw on the front of the case. Cases shall be dust-tight, and fitted with non-glare glass. All meters shall have an accuracy within one (1) percent and shall be similar and equal to GE Type AD-7. The scales shall be not less than five (5) inches long.

(h). Instrument and Current Transformers. Instrument transformers shall be of a standard manufacture, designed in accordance with A.I.E.E. standards, and suitable for the requirements of the service indicated. Current transformers shall safely withstand the maximum short circuit current which may be encountered on the system and shall be provided with an approved secondary short circuiting device.

(i). Instrument Switches. Instrument switches for switchboard mounting shall be of rotary type similar and equal to GE Type SB-1.

(j). Switchboard Ground Bus. A switchboard ground bus shall be provided to which grounds of all circuits requiring grounding shall be connected. The bus shall be one-quarter-by one inch (1/4" x 1") copper bar. The bus shall be fastened to the switchboard in an approved manner and shall be located so as not to interfere with the accessibility of the equipment.

(k). Equipment. Panel No. 1. Mounted on the panel there shall be:

- 1 - Ammeter, A.C., 5 ampere coil with 0-150 ampere scale, G.E. No. 94X136 or equal.
- 1 - Ammeter switch, 3 independent circuits, 6 stages, with knurled handle, G.E. No. 16SB1CA7 or equal.
- 1 - Ammeter, D. C. 10 Ampere coil with 0-10 ampere scale, G.E. No. 94X157 or equal.
- 1 - Voltmeter, A.C., 150 volt coil with 0-150 volt scale, G.E. No. 94X113 or equal.
- 1 - Voltmeter switch, phase-to-neutral, sp3t, 2 stages, with knurled handle, G.E. No. 16SB1C6 or equal.

- 1 - Frequency meter, 115 volt coil, 55-65 cycle scale, G.E. No. 94X412 or equal.
- 1 - Frequency switch, phase-to-neutral, spdt, 2 stages, maintained contacts, escutcheon marking "Generator - Line", with knurled handle, G.E. style SB-1 or equal.
- 1 - Voltage regulator, direct, quick-acting, rheostatic type, regulating the voltage by varying directly the resistance in the exciter field circuit. Westinghouse type SRA-JR, or equal, having a rated sensitivity of ± 3 percent under steady load conditions.
- 2 - Indicating lamp receptacles, 1-3/8" diameter, complete with 1200 ohm resistors for normal operation at 125 volt service, Westinghouse No. 549462 or equal.
- 2 - 18-volt indicating lamps (T-4 bulb) with candelabra screw base, Westinghouse No. 549474 or equal.
- 1 - Indicating lamp lens, red glass, Westinghouse No. 549468 or equal.
- 1 - Indicating lamp lens, green glass, Westinghouse No. 549469 or equal.
- 1 - 150-ampere, 600-volt, 3-pole manually operated air circuit breaker, 15,000 ampere interrupting capacity, three thermal-magnetic overcurrent trips, arc quenchers, pushbutton mechanical trip, position indicator, pistol grip handle for closing, mounted on an ebony-asbestos base with dead-front box barrier but without dead-front steel plate. G.E. type AE-1-15 or equal.
- 1 - 150-ampere, 250-volt, 3-pole double-throw knife switch, dead-front operated for back-of-board mounting, Barkelow type H double-throw or equal.
- 1 - Exciter field rheostat to be furnished by the manufacturer of the standby unit and installed as directed by the Contracting Officer.

Mounted in the rear of the panel there shall be:

- 3 - Current transformers, 600 volts, 50-60 cycles, 150/5 ampere ratio, G.E. type JL-9, Cat. No. 258X21 or equal.

Panel No. 2 - Mounted on the panel there shall be:

- 1 - Watthour meter to be furnished by others and installed as directed by the Contracting Officer.

- 1 - Water level recorder to be furnished by others and installed as directed by the Contracting Officer.
- 6 - Air circuit breakers, 250 volts A.C. 3-pole, 100 ampere frame for flush mounting, G.E. type AF-1 or equal, with studs for back connections and having the following trip ratings:
 - 20 amperes, feeder to the Oil Pump Motors.
 - 25 amperes, feeder to Lighting Panelboard A.
 - 25 amperes, spare
 - 35 amperes, spare
 - 35 amperes, feeder to Lighting Panelboard B.
 - 70 amperes, feeder to Maintenance Building.

Mounted in the rear of the panel there shall be:

- 1 - Single pole tumbler switch, Hubbell No. 9805 or equal.
- 1 - Fuse, ferrule contact type, renewable, 3 ampere capacity, 2 inch overall length, $\frac{1}{2}$ inch tube diameter.
- 1 - Cartridge fuse cutout base, single pole barrier type with porcelain base, Bryant No. 3929 or equal.

Space provided for mounting 3 current transformers to be furnished by others and installed as directed by the Contracting Officer.

(l). Nameplates. Nameplates of anodized aluminum or laminated bakelite shall be furnished to designate each circuit and the function of each instrument. Marking shall be done by engraving.

(m). Rubber Insulating Mat. Rubber insulating mat, thirty (30) inches wide, conforming to the requirements of Paragraph TP-9-06 shall be furnished and placed in front of the switchboard, extending through its full length.

(n). Data to be Submitted for Approval. Complete detail drawings indicating construction of the switchboard, front, plan and sectional views, schematic and construction wiring diagrams, and a list of all equipment indicating the manufacturer, rating and type of

each item, shall be furnished the Contracting Officer for approval before commencing switchboard manufacture.

(o). Wiring Diagrams. Five (5) prints of wiring diagram of the switchboard as installed shall be furnished the Contracting Officer. All external power and lighting connections shall be designated in accordance with the wiring diagram.

(p). Tests. The switchboard shall be given the standard di-electric test for six hundred (600) volt equipment and tests for successful operation at the factory. The calibration of all meters shall be checked by a representative of the meter manufacturer after the switchboard has been installed and connected ready for operation.

TP-9-15. ACCESS ROAD LIGHTING

(a). General. The contractor shall furnish, install and connect as indicated on the drawing six (6) lighting standards and luminaires.

(b). Standard. The standards shall be hollow spun granite standard with transformer base similar and equal to Westinghouse style No. 338223 for fourteen-foot (14') height of luminaire and style No. 338225 for sixteen-foot (16') height of luminaire, and shall be equipped with type "U" fitter. Standard shall be securely anchored to a reinforced concrete base two (2) feet square and seven (7) feet long firmly set in the ground. A three-inch (3") steel conduit shall pass from the base of the standard through the concrete base to the duct line as indicated on the drawings.

(c). Luminaire. The luminaire shall be similar and equal to Washington style No. 352399 as manufactured by Westinghouse Electric & Manufacturing Co.

TP-9-16. TESTS.

(a). Lighting Installation. The individual circuits shall be tested before connection of fixtures and equipment by applying a potential of twice the operating voltage for a five (5) minute period between conductors, and between the ungrounded wires and ground. Insulation resistance shall be measured after application of test voltage. A final insulation resistance test shall be made after all equipment and fixtures have been connected, but with lamps omitted. For all tests, the resistance values shall conform to the requirements indicated in the National Electrical Code.

(b). Power Distribution Installation. The applicable provisions of the tests on lighting installation shall be followed for testing power distribution installation.

(c). Incoming Power Circuit. The incoming power circuit shall be tested after pothead installation has been completed. The primary connections in the transformer vault shall be tested after make-up, but before connecting to pothead, cutouts, and transformers. The tests shall consist of a high voltage test and an insulation resistance test. Tests shall be conducted in accordance with the applicable standards of the A.I.E.E.

(d). Equipment, Material and Supplies. Except for the main switchboard, all material, equipment, and supplies shall receive standard factory tests in conformance with the standards and procedures of the A.I.E.E., N.E.M.A., and A.S.T.M., the standards of the A.I.E.E. taking precedence whenever applicable.

(e). Test Equipment. Insulation resistance shall be tested by means of a five-hundred (500) volt D-C direct reading "Megger" type insulation tester or other suitable equipment as approved by the Contracting Officer.

(f). Grounds. Ground resistances shall be tested by a "Megger" type ground tester or by other method as approved by the Contracting Officer.

TP-9-17. FINAL ACCEPTANCE TEST.

(a). General. The final acceptance test shall be made on the complete installation over a period of three (3) successive calendar days. During this period all equipment and circuits shall be put into operation. Lighting circuits shall be energized for two (2) twelve-hour periods with intervening shutdown of twelve (12) hours. Tests of circuits and equipment other than lighting shall be as directed by the Contracting Officer. Test runs shall be made with the gasoline-electric generating unit supplying power, and with such equipment operating from this source as may be directed by the Contracting Officer.

The contractor shall notify the Contracting Officer of test dates three (3) days in advance. Test results shall be logged, and three (3) certified copies furnished the Contracting Officer.

TP-9-18. PAYMENT.

(a). Payment for furnishing and installing all items necessary to construct the various electrical systems complete as covered by this section of the specification and as indicated on the drawings will be made at the contract lump sum price for Item No. 44,

"Electric Power, Lighting and Telephone System", Payment will be made for other items of work required to complete the systems, as follows:

Trench Excavation	Items Nos. 6 and 7
Trench Backfill	Item No. 16
Cement	Item No. 28
Reinforcing Steel in Manholes	Item No. 29

Except as hereinbefore provided, no separate payment will be made for performing work specified in other sections of these specifications but required to complete the electric power, lighting and telephone system.

(b). The payment for furnishing and installing all items necessary to complete the various systems covered by this specification and as indicated on drawing No. 56, File No. M19-59/6 "Maintenance Building Electrical" will be made at the contract lump sum price for Item No. 54, "Maintenance Building". The limits of work applicable to the Maintenance Building are delineated on the drawing.

SECTION 10 - ACCESS ROAD AND TOPSOILING (ITEMS NOS 45
TO 50 INCLUSIVE)

TP-10-01. GRAVEL BASE FOR ROADWAY (Item No. 45).-

(a) General.-- The contractor shall furnish and place gravel of the size and quality specified below for the access roads and parking areas, and for the roadway along top of the dam, to the lines and grades shown on the drawings or as directed.

(b) Materials.-- (1) The material shall consist of suitable gravel composed of hard, durable particles free from clay lumps and organic material. It shall be composed of such sizes that it will fall within the gradation given below and in addition it shall be well graded with no predominance of any one size, and shall have sufficient binder to provide a stable paving under rolling and traffic.

Square Mesh Sieve

Percent by Weight
Amount Passing-Total

3 inch	100
1 inch	60 - 100
#4	30 - 60
#10	15 - 40
#40	3 - 20
#200	0 - 5

Percent of wear, Los Angeles

Rattler test after 500
revolutions.

Not over 50 per cent

(2) If the binding material in locally available gravel is not sufficient to insure satisfactory bonding, and such gravel is used, the contractor shall at no additional cost to the

Government furnish sufficient additional binding material, and by satisfactory manipulation incorporate it in the gravel. That portion of the binder material added to the gravel passing the No. 40 sieve shall have a liquid limit of not more than twenty-five (25) and a plasticity index of not more than six (6) as determined by the AASHTO methods T-89 and T-91 respectively. If the material, as received, fails to maintain suitable proportions or is not well graded between the maximum and minimum sizes specified, it shall be rejected or mixed in such manner as to furnish a material meeting the above requirements. The material shall be obtained from Borrow Areas B1 and B2 or from sources obtained by the contractor which shall have prior approval by the Contracting Officer.

(c) Subgrade Preparation.- Excavation for pipe, culverts and conduit shall be made, the installations completed and the backfill placed and compacted prior to preparation of the subgrade. Prior to placing the bank-run gravel base, the contractor shall remove and dispose of all soft and unstable material. The areas from which unsuitable material has been removed shall be brought to grade and cross section with satisfactory material and the entire area scarified, as directed, and compacted. The compaction of soils or materials for the fine grading of subgrade shall be obtained with at least four (4) passes of the tractor specified in subparagraph (d) following and self-propelled rollers weighing not less than ten (10) tons. The rolling shall cover the entire area of the subgrade accessible to the roller and any portion that is inaccessible to a roller shall be compacted by mechanical or hand tampers to the satisfaction of the Contracting Officer. Water shall be added to assist compaction when directed.

(d) Placing.- (1) The material shall be placed in two (2) layers, a base course and a top course. Each layer shall be six (6) inches thick before compacting. Gravel shall not be deposited on the subgrade while it is in a "muddy" condition nor until it has been inspected and approved by the Contracting Officer. After the subgrade or foundation shall have been properly prepared, the bottom course of gravel shall be spread evenly by means of approved spreader equipment or trucks. The spread gravel shall be well-graded with no pockets of fine material or segregation of large and fine particles. After the base course has been properly and satisfactorily compacted, the top course shall be spread and compacted to the required thickness. Each course of the gravel, after being spread, shall be compacted by six (6) passes of crawler type tractors weighing at least twenty-nine thousand (29,000) pounds and then rolled smooth with a self-propelled three-wheel road roller weighing not less than ten (10) tons. Any portion of either course which is not accessible to the compaction equipment and roller shall be compacted thoroughly with hand tampers to obtain the same degree of compaction as the material which has been rolled as specified. Water shall be added by means of a sprinkling wagon, or other approved method, to effect substantial saturation to facilitate compaction.

(2) Rolling shall start longitudinally at the side and gradually proceed toward the center of the roadway overlapping on successive trips. During the process of rolling, the gravel shall be dragged. The dragging and rolling shall continue until the gravel does not creep or wave under the roller.

(e) Shoulders.- Shoulders shall be constructed as shown in the drawings. Before the final completion of the work, the shoulders

shall be reformed, trimmed, raked, and rolled.

(f) Measurement and Pavement.-- (1) The quantity of gravel base to be paid for will be the number of cubic yards of gravel furnished and placed within the limits specified and indicated on the drawings. The gravel will be measured in place after compacting. No measurement for payment will be made for gravel placed over and above the twelve inch (12") depth indicated.

(2) Payment for all work in connection with furnishing, excavating, hauling and placing gravel will be made at the contract unit price for Item No. 45, "Gravel Base for Roadway". The contract unit price also includes all costs of wetting, rolling, compacting the gravel and for fine grading of gravel surfaces. Gravel obtained from Borrow Areas "B1" and "B2" or from borrow areas obtained by the contractor will be paid for at the contract unit price for Item No. 45 only. Payment will not be made for borrow excavation for gravel for roadways at the contract unit prices for Items 8 or 9 whether or not it is taken from Borrow Areas "B1" or "B2". The quantity of gravel removed from Borrow Areas for roadway construction will be deducted from the Borrow Area excavation quantities.

TP-10-02. BITUMINOUS PAVING (Item No. 46).--

(a) General.-- The contractor shall furnish and construct the bituminous macadam surface of the specified quality required for the access road and parking area as shown on the drawings or as directed by the Contracting Officer.

(b) Description.-- The pavement shall consist of a one-course wearing surface, of three inch (3") compacted thickness, composed of crushed stone and bound with keystone and bituminous material, with a

bituminous seal coat and peastone covering, constructed on a prepared base course by the penetration method, in accordance with these specifications and in conformity with the lines, grades, and typical cross-sections shown on the drawings or as directed by the Contracting Officer.

(c) Base Preparation.-- (1) The base will have been constructed previously to its own finished grade and cross section as shown on the drawings. The base shall be maintained in acceptable condition during placement of the macadam wearing surface and any damaged areas of the base shall be repaired to the satisfaction of the Contracting Officer.

(2) Shoulders shall be relined, graded, and compacted in order to provide lateral support for the edge of the pavement and to permit the roller to lap at least one-half ($\frac{1}{2}$) the width of a rear wheel when rolling the edge. Immediately prior to applying coarse aggregate, the base course shall be swept and cleaned of all foreign substances and excess fines on the surface.

(d) Materials.-- (1) Crushed stone shall consist of clean, hard, tough, and durable fragments of rock of uniform quality throughout. It shall be free from soft disintegrated pieces, dirt, crusher dust, and organic or other objectionable matter. Coarse aggregate of a size retained on a one inch (1") square mesh sieve shall not contain more than five (5) per cent of flat or elongated pieces whose length exceeds three times their least dimensions. When tested by means of the Los Angeles Rattler (A.A.S.H. O. T96-38) the crushed stone shall show a loss on abrasion not to exceed twenty-five per cent (25%) at five hundred (500) revolutions.

(2) Coarse aggregate shall conform to the following gradation:

<u>Square Mesh Sieve</u>	<u>Total Passing Percent by Weight</u>
2-1/2 inch	100
2-1/4 inch	95 - 100
2 inch	70 - 90
1-1/2 inch	20 - 50
1-1/4 inch	0 - 15
1 inch	0

(3) Keystone used for binding or choking the coarse aggregate shall conform to the following gradation:

<u>Square Mesh Sieve</u>	<u>Total Passing Percent by Weight</u>
1 inch	100
3/4 inch	95 - 100
1/2 inch	30 - 70
3/8 inch	0 - 20
No. 4	0 - 5

(4) Pea stone used for sealing the surface of the pavement shall conform to the following gradation:

<u>Square Mesh Sieve</u>	<u>Total Passing Percent by Weight</u>
3/4 inch	100
1/2 inch	95 - 100
3/8 inch	30 - 70
No. 4	0 - 20
No. 8	0 - 5

(e) Bituminous Material.-- Bituminous material shall be asphalt cement, conforming to Federal Specification SS-A-706b for

"Asphalt; (for Use in) Road and Pavement Construction", Grade AP-3 of 85-100 penetration grade and applied at temperature of 275 deg. - 350 deg. F.

(f) Equipment.-- (1) Rollers shall be three-wheeled, self-propelled, smooth-wheeled, weighing not less than ten (10) tons. Rollers shall be equipped with a water spraying device or other approved equipment to prevent bitumen from sticking to the wheels. Rollers shall be in good mechanical condition and shall not drip oil, gasoline, or other foreign substance on the road surface.

(2) Mechanical spreaders for distributing stone shall be of a type approved by the Contracting Officer. The use of power-blade graders for spreading stone will not be allowed.

(3) Pressure distributors shall be of an approved type, equipped with pneumatic tires, capable of spraying satisfactorily, if required, for a width of not less than fifteen (15) feet at a pressure between forty (40) and sixty (60) pounds per square inch. They shall be equipped with a system for heating the bituminous material that insures the even heating of the entire mass of material under efficient and positive control at all times. Distributors shall also be equipped with satisfactory thermometers for measuring the temperature of the material to be applied and shall have either a steam or air-kerosene system for the clearing of lines and pumps. Evidence of fluxing with kerosene or emulsification by steam will be sufficient cause for rejection of the delivery. Distributors shall be capable of spreading the bitumen uniformly, shall not leak, and must be in good mechanical condition. The distributors shall also be equipped with accurate tachometers approved by the Contracting Officer. Deliveries of bitumen

will be refused when the above conditions are not fulfilled.

(4) Hose attachments to the distributor and slotted spout hand-pouring pots shall be used to apply bitumen wherever necessary to touch up all spots unavoidably missed by or inaccessible to the distributor.

(g) Soreading and Compacting Coarse Aggregate.— (1) On the freshly cleaned and swept base course, coarse aggregate shall be spread by mechanical spreaders of approved types in such manner that segregation of sizes is prevented. Aggregate shall be spread in a uniform, loose layer to conform with the specified grades and thicknesses when compacted. The aggregate shall then be dry rolled until the stone is thoroughly compacted and keyed together to form a firm even surface true to grade and cross sections given.

(2) The rolling shall begin with the outside rear wheel covering equal parts of the shoulder and coarse aggregate and shall progress gradually from the edges toward the center lapping uniformly each preceding rear wheel track by one-half ($\frac{1}{2}$) the width of such track. The rolling shall continue until the entire area of the pavement has been rolled by the rear wheels and become thoroughly keyed, interstices of the metal reduced to a minimum, and creeping of stone ahead of the roller no longer visible. Any portion of the pavement not accessible to rollers shall be thoroughly compacted by mechanical or hand tamping. Hand tampers shall weigh not less than fifty (50) pounds and have a face area of not more than one hundred (100) square inches.

(3) The compacted coarse aggregate shall then be examined to insure that it possesses a firm even surface, true to the required grades and cross section, and presents a texture which will

allow a uniform penetration of the bituminous material. If any irregularities in surface grades or texture appear during or after rolling, they shall be promptly remedied by reconstruction as directed by the Contracting Officer. All coarse aggregate which becomes coated or mixes with dirt or foreign substances, prior to penetration with bituminous material, shall be removed, replaced with clean aggregate and recompact. Concentrations of fine or undersize aggregate or flat or oversize aggregate appearing on the surface shall be removed and replaced.

(h) Application of Bituminous Materials.- (1) Over the surface of the coarse aggregate, spread and rolled as described above, hot bituminous material shall be applied uniformly by approved pressure distributors at the rate of one and one-half ($1\frac{1}{2}$) to one and three-quarters ($1\frac{3}{4}$) gallons per square yard. The bituminous material shall be applied only when the crushed stone is thoroughly dry, when the weather is not foggy or rainy, and when the air temperature in the shade is sixty degrees (60°) F. or above, unless otherwise directed by the Contracting Officer.

(2) In order to insure uniformity at the junction of two (2) applications of bituminous material, the contractor shall employ methods acceptable to the Contracting Officer so that penetration is accomplished at the full force of the sprayers on both sides of each junction point. The method used shall eliminate gaps and overlapping of the bituminous material at longitudinal and other joints. Building paper, if used for this purpose, shall be removed and burned.

(3) The contractor shall cover the surface of curbs, edgings, walls, walks, or adjacent surfaces satisfactorily to prevent

coating them with bituminous material and shall remove any bitumen that may have adhered to the surfaces in spite of such protective measures.

(4) After application of the bituminous material, all surplus materials on the shoulders shall be removed before rolling begins so that the shoulder may be rolled in conjunction with the wearing course.

(i) Application of Keystone.- Immediately after applying the penetration coat of bituminous material, and while it is still warm, clean, dry keystone shall be spread longitudinally over the surface in such quantity as will completely fill the voids in the coarse aggregate. The keystone shall be spread by approved type of mechanical spreaders operating backwards so as not to travel over uncovered bituminous material, or from piles previously placed along the shoulders. The surface shall then be rolled and broomed until the keystone is thoroughly bonded with the bituminous binder and until the surface is well compacted and uniform in appearance.

(j) Application of Seal Coat.- (1) All excess keystone shall be removed and the surface swept clean. A seal coat of bituminous material shall be applied uniformly at one-half (1/2) to three-quarters (3/4) gallon per square yard of surface. After this seal coat has been spread, it shall be covered immediately with clean, dry pea stone applied longitudinally in just sufficient quantity to blot up the bituminous material. The entire surface shall then be broomed and rolled.

(2) During the period between the initial compaction of the coarse aggregate and completion of the seal coat, the surface course shall be protected from all traffic other than that absolutely essential to its construction.

(k) Surface Tolerances.-- After completion, the surface shall be tested with ten-foot (10') straight edge in both directions. The surface of the finished pavement shall be free from irregularities exceeding three-eighths ($3/8$) of an inch in ten (10) feet.

(1) Measurement and Payment.-- (1) The quantity to be paid for under Item No. 46 will be the number of square yards of bituminous macadam satisfactorily constructed within the pavement limits indicated on the drawings.

(2) Payment will be made at the contract unit price for Item No. 46, "Bituminous Paving", which price shall include all costs of furnishing, placing and compacting the pavement as specified, and the cost of furnishing and applying all bituminous materials and pea stone cover.

TP-10-03. COBBLE GUTTERS (Item No. 47)

(a) General.-- Paved gutters shall be installed to the lines and locations shown on the drawings or as directed by the Contracting Officer.

(b) Material and Placing.-- Rock for gutters shall be sound unweathered rock free from cracks and of acceptable shapes and sizes. Stone shall be angular and of uniform shape so as to furnish a reasonably smooth even face. No individual stones for gutters shall be less than ten (10) pounds or more than thirty (30) pounds in weight and at least seventy-five percent (75%) of the stone shall be at least twenty (20) pounds in weight, shall have one (1) dimension equal to the depth of the paving. The stones shall be hand placed with a tolerance of not more than one inch (1") above or below the finished surface shown on the drawings. Stone shall be closely laid with cracks in the surface

chinked with tightly driven spalls.

(c) Measurement and Payment.- (1) The quantity to be measured under Item No. 47 will be the number of square yards of paved gutters completed as indicated on the drawings, or directed by the Contracting Officer. Longitudinal measurement will be along the slope and cross measurement will be in horizontal projection of the inside width.

(2) Payment will be made at the contract unit price for Item No. 47, "Cobble Gutters", which price includes the cost of furnishing, loading, hauling, selecting, placing, and trimming the stone whether furnished from stock pile or other sources.

TP-10-04. SEEDED TOP SOIL (Item No. 48)

(a) General.- Topsoil shall be placed over the areas shown on the drawings or required by the Contracting Officer, to the indicated depth of six (6) inches after compaction, and treated as specified. The following areas shall be topsoiled and treated:- shoulders, slopes, and ditches at main Access Road; graded area at Maintenance Building; berm north of Equipment Building; upstream blanket of dam; areas between the toes of the dam embankments and the clearing lines, above Elevation 678 upstream and Elevation 670 downstream and elsewhere as may be required by the Contracting Officer to prevent erosion or to repair construction damage; and any other areas directed by the Contracting Officer to be topsoiled and treated.

(b) Topsoiling.- (1) Topsoil.- a. Topsoil shall be natural, fertile, friable loam, consisting of a mixture of sand, silt and clay particles and containing four (4) to twelve (12) percent organic matter as determined by loss on ignition of oven dry samples, and shall have demonstrated its suitability by the support of heavy growth of native

crops, grass and other vegetation. The topsoil shall be free from subsoil, gravel, clay lumps, sod, roots and refuse. Topsoil, as placed, shall not contain stones which will be retained on a one-inch screen or any other materials or substances which will be harmful to plant growth or a hindrance to grading, planting and maintenance operations. Topsoil shall not be excessively acid or alkaline.

b. Topsoil obtained from stripping operations may be used when such topsoil meets the above requirements. The contractor shall furnish, from other approved sources, all additional topsoil required for the completion of the work. The topsoil will be inspected by the Contracting Officer four (4) weeks in advance of the contemplated date of use, and the contractor shall assist the Contracting Officer in obtaining soil samples for test from several locations on the contemplated borrow area. The topsoil shall be obtained from locations which are approved as most favorable for the proposed plantings as indicated by field observation and tests.

(2) Subgrade Preparation.— Prior to placing topsoil, the subgrade shall be brought to the required lines and grades, and all embankment compaction shall have been completed in the area. Where, in the opinion of the Contracting Officer, the subgrade is excessively compacted, it shall be scarified to a depth of at least two inches to provide proper bend between the topsoil and the subgrade. Any water pockets resulting from the scarifying operations shall be eliminated prior to spreading topsoil. The subgrade shall be raked clean of all rubbish, stones larger than four (4) inches, and any other materials detrimental to the proper bending of the topsoil, to the rise of capillary moisture and to the proper growth of the desired planting.

(3) Placing Topsoil.- The topsoil shall be spread evenly so as to obtain the full compacted thickness indicated on the drawings for the area. The topsoil shall be placed only when it can be soon followed by seeding, and shall not be placed when the subgrade is excessively wet, extremely dry, frozen, or in a condition detrimental to the seeding operations or to proper grading. The topsoil shall be compacted by an approved method which will result in a density sufficient to provide proper rise of capillary moisture through the topsoil.

(c) Application of Fertilizer and Lime.- (1) General.- The topsoil shall be treated with fertilizer, lime and other chemicals in such quantities as an analysis of the topsoil indicates as necessary to support the required grass growth.

(2) Materials.- a. Fertilizer.- The Government will furnish all fertilizer, which will be a dry, free flowing, commercial fertilizer suitable for application by a common fertilizer distributor, grain drill, planting machine or similar standard equipment.

b. Lime.- The lime shall be furnished by the contractor. Lime shall be ground Dolomite limestone containing 95 percent total calcium and magnesium carbonates and ground to such fineness that fifty percent (50%) passes a 200-mesh sieve and one hundred percent (100%) passes a 20-mesh sieve.

c. Other Chemicals.- The Government will furnish any other chemicals such as potash, phosphates or arsenate of lead that analysis of the topsoil indicates as required to support the desired growth.

(3) Application Methods.- a. Lime.- The contractor shall apply the lime uniformly to the seed bed as early as possible before

sowing the seed, and not less than ten (10) days before fertilizing. The rate of application shall be as specified by the Contracting Officer but will not exceed fifteen hundred (1500) pounds per acre. The lime shall be raked or harrowed into the topsoil for a depth of three-quarters (3/4) inch.

b. Fertilizer.— The contractor shall apply the fertilizer uniformly to the seed bed at the rate established by the Contracting Officer, but not in excess of two thousand (2000) pounds per acre and shall rake or harrow the fertilizer into the topsoil for a depth of three-quarters (3/4) inch. The time of application shall be dependent upon the type of fertilizer furnished by the Government.

c. Other Chemicals.— In the event that the analysis of the accepted topsoil indicates the need of other chemicals to support grass growth, the required chemical will be furnished by the Government and shall be applied by the contractor at such times and rates and in such a manner as is directed by the Contracting Officer.

d. Seeding.— (1) General.— The contractor shall sow all grass seed within the following two periods:

April 30 to June 15

August 15 to October 1

In the event that he places topsoil and fails to sow grass seed within the above dates, he shall sow a temporary cover crop of rye or oats pending the sowing by grass during the specified period. Rye shall be sown between October 1 and April 30, and oats shall be sown between June 15 and August 15.

(2) Seed.— The Government will furnish all grass, rye and oat seed required to accomplish the specified seeding.

(3) Preparation of the Seed Bed.- The soil shall be thoroughly loosened to a depth of three-quarters (3/4) inch by harrowing or other approved method. During the tillage operation, the surface shall be cleared of all sticks, wire, stones, hard lumps, large roots, weeds and trash or other litter.

(4) Rate of Seeding.- a. Grass Seed.- The seed shall be sown at the rate as specified by the Contracting Officer, but not exceeding one hundred (100) pounds per acre.

b. Temporary Seeding.- In the event a temporary cover crop is required, it shall be sown with oats at the rate of twenty-five (25) pounds per acre or rye at the rate of forty (40) pounds per acre, according to the season. When the proper period for sowing the permanent grass seed arrives, the temporary crop shall be mowed close to the ground and left as a mulch. All work required to sow and mow temporary cover crops and incidental work connected therewith, shall be performed at the contractor's expense.

(5) Method of Sowing.- The contractor shall take advantage of favorable weather conditions. Seeding shall not be performed when the soil is excessively wet or extremely dry, or on windy days if mechanical broadcasting is employed. Seeding shall be performed by use of approved power drawn drills or seeders, or by directions at right angles to each other. Immediately after seeding by a broadcast method the seed shall be placed in contact with the soil by means of a brush, spike tooth harrow or similar device as directed by the Contracting Officer.

(6) Clean up.- After the seed is sown and prior to compacting, the surface shall be cleared of all stones or other

objects larger than two (2) inches in diameter and of all wire, roots, brush, or other objects that will interfere with mowing operations.

(7) Compacting.-- Immediately after the clean up, the entire seeded area shall be compacted by means of a culti-packer, roller or other approved method of reducing air pockets to a minimum. Compacting shall be done at right angles to the existing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust erosion, as directed by the Contracting Officer.

(8) Maintenance.-- The contractor shall maintain seeded areas until the work under the contract is completed and accepted. Maintenance shall consist of protection against traffic, mowing of all grass and weeds which tend to smother new seedlings, sprinkling during periods of drought, repair, regrading, fertilizing and reseeding of areas which fail to show a uniform stand of grass or are washed away, and the repair of areas damaged through the contractor's own operations or negligence.

(c) Measurement and Payment.-- (1) Measurement of seeded topsoil will be made parallel to the slope for each acre of area prepared as specified with six (6) inches of topsoil normal to the slope and seeded with permanent grass seed within the lines shown on the drawings or as modified by the Contracting Officer.

(2) Payment will be made at the contract unit price for Item No. 48, "Seeded Topsoil", which price includes all costs of all work in connection with furnishing, placing, spreading and rolling all topsoil, including stockpiling, rehandling and rehauling, as required or directed, furnishing lime, preparing seed bed with lime, fertilizer and other chemicals, sowing seed, raking and rolling the seeded areas, and

maintaining all seeding areas. Separate payment will not be made for the sowing and mowing of temporary cover crops where required; all costs of such work shall be included in the cost of other items of work.

TP-10-05. SEEDED GUTTERS AND DRAINAGE TRENCH.

(a) General.-- Seeded gutters and drainage trench shall be constructed in the locations indicated on the drawings to form positive drainage into natural drainage areas. After the subgrade of the adjacent areas have been graded and compacted as specified, the gutters and trench shall be excavated to the lines, grades and cross-sections shown on the drawings or as modified by the Contracting Officer. After shaping has been accomplished, topsoil shall be placed and compacted to the thickness indicated on the drawings and where not indicated, as specified for the adjacent seeded areas. The gutter and trench shall then be dressed to the required lines and grade. The topsoil shall be prepared, limed, fertilized, seeded and otherwise treated as specified for seeded topsoil in Paragraph TP-10-04.

(b) Measurement and Payment.-- Payment for constructing seeded gutters and drainage trench will not be made as a separate item. Measurement and payment for excavating and shaping the gutters and trench will be made as specified in paragraph TP-4-04 for Item No. 5, "Excavation-Common." Measurement and payment for furnishing, placing, fertilizing, liming, seeding and otherwise treating topsoil will be made as specified in paragraph TP-10-04 for Item No. 43, "Seeded Topsoil."

TP-10-06. HIGHWAY GUARD RAIL (Item No. 49).

(a) General. The contractor shall furnish and construct as shown on the drawings highway guard rails along access road in the

location shown or as directed by the Contracting Officer.

(b) Material.- (1) The posts of the sizes and dimensions shown on the drawings shall be constructed or reinforced concrete using a maximum size aggregate of three-quarters ($3/4$) inch and meeting the requirements of Section 6. Reinforcement shall conform to paragraph TP-6-20.

(2) The wire rope shall be three-quarters ($3/4$) inch in diameter conforming to Federal Specification RR-R-571a, for "Rope; Wire", Type III, 3 x 7 wire rope, annealed steel.

(3) All fittings for the highway guard rail except anchor rods, nuts and washers shall be galvanized dropped forgings conforming to the requirements of ASTM Designation A273-44T for "Carbon-Steel Blooms, Billets and Slabs for Forging". Anchor rods, nuts and washers shall be wrought iron or structural steel conforming to the requirement of paragraph TP-7-01(b). The cables shall be fastened to the concrete posts with offset fittings as shown on the drawings. Each cable is to be attached to the respective socket by hot zinc socketing conforming to paragraph I-12 of Federal Specification RR-R-571a.

(c) Construction.- The posts for the highway guard rail shall be spaced and securely set and the cable strung as shown on the drawings. Backfill around posts shall be thoroughly tamped in place. The cable shall be drawn taut and anchored as shown on the drawings. After erection, all exposed surfaces of the posts shall receive a uniform application of a solution consisting of eight (8) pounds of zinc sulphate and one (1) gallon of water. After this application has dried the post shall be thoroughly brushed to remove surface crystals of the zinc sulphate. Painting will be done in accordance with Section 4.

(d) Measurement and Payment.- (1) Measurement will be made of the linear feet of highway guard rail installed as specified and within the limits shown on the drawings from outer post to outer posts with an additional allowance of five (5) feet each to cover cost of end braces.

(2) Payment will be made at the contract unit price for Item No. 49, "Highway Guard Rail", which price shall include all costs of all materials, labor and work pertaining thereto including excavation and backfilling for posts.

TP-10-07. GATE POSTS, DROP INLET AND PIPE CULVERT (Item No. 50).

(a) General.- The contractor shall construct gate posts according to details shown on the drawings at the two (2) locations indicated. One (1) drop inlet shall be constructed on the Main Access Road as detailed on the drawings. Corrugated metal pipe culverts shall be installed at locations on the Main Access Road and on the West Access Road at locations shown on the drawings.

(b) Material & Workmanship.- (1) Concrete shall conform to the requirements of Section 6 using a maximum aggregate size of three-quarters (3/4) inch.

(2) Corrugated metal pipe shall conform to Federal Specification QQ-C-806, for "Culverts; Iron or Steel, Zinc-Coated", and shall be placed in accordance with the requirements of paragraph TP-7-03. Excavation shall conform to paragraph TP-4-05. Backfill shall conform to paragraph TP-5-07.

(c) Payment.- Payment for furnishing all labor and materials and doing all work not specifically called for under other items to construct the gate posts, drop inlet, and corrugated metal pipe culverts, as herein specified or shown on the drawings, will be made at

the contract lump sum price for Item No. 50 for "Gate Posts, Drop Inlet and Pipe Culvert". Reinforcing steel for drop inlet only will be paid for under Item No. 29, cement under Item No. 28, chain at gate posts under Item No. 31, excavation under Items Nos. 5, 6 and 7, as applicable, and backfill under Item No. 16.

SECTION 11. WATER SUPPLY WELL (ITEM NO. 51)

TP-11-01. GENERAL - The contractor shall drill and case a well for water supply at the site of the proposed Maintenance Building, and shall conduct specified drawdown tests.

TP-11-02. MATERIAL - The casing shall be six inch (6") extra heavy wrought iron pipe conforming to the requirements of Federal Specification WW-P-441a for "Pipe; Wrought-Iron, Welded, Black and Zinc-Coated." All casing couplings shall be threaded and shall be watertight.

TP-11-03. PROCEDURE - (a) The casing shall be driven through overburden and approximately one (1) foot into weathered bedrock. This material shall be penetrated by churn drilling or other method approved by the Contracting Officer in such a manner that the casing may be installed as the drilling progresses. After the casing is seated and sealed to rock, a four-inch (4") diameter hole shall be drilled into weathered and solid bedrock for a minimum of fifteen (15) feet. Yield tests shall then be made under the direction of the Contracting Officer to determine the capacity and drawdown of the well. If a twenty-four (24) hour test proves that a continuous pumping of fifteen (15) gallons per minute results in a drawdown in excess of fifteen (15) feet, the contractor shall continue drilling to such depths as ordered by the Contracting Officer. The casing shall be capped at Elevation 685.17 at the completion of the drilling operation.

(b) Before capping the well, the casing shall be chlorinated by the adding of a solution of water and hypochlorite of lime mixed to obtain free chlorine in the proportion of fifty (50) parts per million.

The solution shall be placed in such a way that it will wash the entire inner surface of the casing and shall be allowed to stand in the well up to ground water level for a period of twenty-four (24) hours, after which time the solution shall be pumped out by the use of sterile equipment.

TP-11-04. MEASUREMENT AND PAYMENT. (a) Measurement will be made from the original ground surface to the bottom of the drilled hole.

(b) Payment will be made at the contract unit price for Item No. 51, "Water Supply Well", for each linear foot measured as above and shall include payment for all costs of driving, drilling, casing and sealing of well regardless of material encountered, and for developing, sterilizing and testing.

SECTION 12. EQUIPMENT BUILDING SUPERSTRUCTURE (ITEM NO. 53)

TP-12-01. SCOPE OF WORK.

The contractor shall furnish all labor and materials and do all work, except that specifically included under other items, required to satisfactorily construct the equipment building superstructure as shown on the drawings and specified. All work above the floor at elevation 687.0 including concrete and structural steel shall be done under this item excepting electrical work and the installation of oil pumps, gasoline-electric standby unit and monorail hoist. Work to be done under this item below elevation 687.0 or outside the building limits includes heating, water supply, sanitary plumbing, sewage disposal and drainage, chimney, doors and frames at entrance to Gate Chamber Passageway and transformer vault, doors and frames at the adit entrance in the west abutment, and roofing and flashing of adit roof.

TP-12-02. STRUCTURAL STEEL.

(a). Material. Lintels, monorail, door frames and other structural steel work shown on the drawings shall be fabricated and erected as shown. All structural steel shapes, plates, etc. shall conform to the requirements of Federal Specification QQ-S-741, for "Steel, Structural (Including Welding) and Rivet; (for) Bridges and Buildings". The fabrication and erection of all structural steel shall conform to the requirements of the current American Institute of Steel Construction Specifications for Design, Fabrication and Erection of Structural Steel for Buildings.

(b). Shop Drawing. Before commencing fabrication, the contractor shall submit to the Contracting Officer, for approval, complete shop details.

(c). Welding. Welding shall be done in accordance with the latest specifications of the American Welding Society.

(d). Painting. All structural steel, before leaving the shop, shall be cleaned of all loose scale, rust, grease and dirt, and given a thorough coat of red lead paint conforming to Federal Specification TT-P-86. Surfaces in contact with each other shall be painted before assembling. Metal to be embedded in concrete shall be left unpainted, but shall be kept free of rust, grease and dirt, and any rust, grease, loose scale, dirt shall be removed just before embedment. Finish coats of steel paint shall be as specified in Section 14.

TP-12-03. CONCRETE.

All concrete work in the equipment building shall conform to the requirements of Section 6.

TP-12-04. BRICK MASONRY.

(a). Face Brick. All brick in exposed exterior and interior faces of exterior walls and exposed faces of partitions shall be first quality grade "A", full color range manganese gray, fire clay face brick of uniform size, similar to the product of the Claycraft Company, of Columbus, Ohio or Kitanning-Martin Brick Company of Kitanning, Pa. Face brick shall be loaded and unloaded by hand to avoid spalls and other injury.

(b). Back-up Brick. Brick for filling-in (or backing-up) shall be common grade "H" red brick of proper size to bond perfectly with face brick, and shall conform to Federal Specification SS-B-656 for "Brick; Building (Common), Clay". Filling-in brick shall be of same size as face brick used.

(c). Samples. Samples of brick the contractor proposes to use shall be submitted to the Contracting Officer for approval prior to delivery of brick at the site.

(d). Sand. Sand for mortar shall be clean, sharp, siliceous, free from loam, silt or other impurities, shall be well graded within the following limits, and shall be subject to the approval of the Contracting Officer.

Sieve No.	Percent
8 Passing	90 - 100
16 Retained	5 - 20
100 Retained	87 - 97

(e). Mortar. Masonry mortar shall be composed of one (1) part Portland cement, one and three-quarters (1-3/4) parts hydrated lime putty, six (6) parts of sand all by volume, and sufficient coloring matter to produce a shade satisfactory to the Contracting Officer. All mortar used for laying masonry shall be thoroughly mixed either by hand, or by a mechanical batch mixer. Mortar which has attained its initial set and retempered mortar shall not be used. The minimum amount of water required to make a workable mortar shall be used.

(f). Workmanship. All brickwork shall be plumb, level, straight and true, and each brick shall be laid in a full bed of mortar and shall be shoved into place so that there shall be no voids or unfilled joints throughout the walls. Brick shall be coursed as

indicated and there shall be full header courses every sixth course in back-up brickwork. All exterior brick shall be laid in Flemish bond. Metal wall ties shall not be used unless directed by the Contracting Officer. Brick shall not be laid overhand. Coursing shall be such as to correspond accurately with window and door heights indicated. Reveals of openings shall be plumb and at right angles to faces of walls. Heads shall be level. Exterior joints shall be weathered. Interior joints shall be flush. Horizontal and vertical joints shall be of the same width. All brick shall be laid with one-quarter-inch ($1/4"$) joints. All window and door frames, lintels, plates, anchors, beams, bolts, or other metal work shall be accurately set and built in. The tops of the unfinished walls shall be covered and protected against the weather. All brick shall be dry when laid in the walls. Brick shall not be laid in freezing weather except with the approval of the Contracting Officer, and then only with such precautions as he may stipulate. At the completion of the brickwork, all defective joints shall be raked out, moistened and pointed with mortar. All exposed brickwork shall be cleaned down with stiff fibre brushes and soap powder and rinsed thoroughly with clean water. Where mortar stains are persistent, a little fine sand and water may be used. Acid shall not be used for cleaning, except with the consent of and under the direction of the Contracting Officer. At angle of roof deck and the parapet wall, terra cotta flashing blocks, similar and equal to Barrett Flashing Blocks, with all internal and external corners, shall be installed.

TP-12-05. CHIMNEY.

The chimney shall be constructed as indicated with the exposed faces inside and outside the building of gray brick of the type specified for exterior walls and partitions. The chimney shall be lined full height with standard fire clay flue lining approximately thirteen inches by thirteen inches. (13" x 13"). Clean-out door and thimble shall be built in. Chimney shall be capped with stone as indicated and detailed.

TP-12-06. CALKING.

(a). Scope of Work. All joints between window and door frames and masonry, between stones in coping and chimney cap, joints at ends of and in window sills shall be calked or painted with an approved calking compound. Calking compound shall be applied by the gun method, using nozzles of proper sizes to fit the several widths of joints. The type of gun shall be subject to the approval of the Contracting Officer.

(b). Materials. Calking compound shall be similar and equal to Tremco Caulking Compound, manufactured by the Tremco Co., Cleveland, Ohio. The compound shall be light in color, of weather-proof and waterproof qualities. The compound shall be stainproof to adjacent materials, shall not be affected by long exposure to outside temperatures, shall not sag, crack or become brittle and shall remain plastic indefinitely.

(c). Preparation of Joint. Calking in joints shall be a minimum of three quarters (3/4) inch in depth. Where adequate grooves for calking have not been provided, grooves shall be prepared

by cutting and cleaning out the mortar to the minimum depth. All particles of mortar, dust and other foreign matter shall be brushed out just prior to calking.

(d). Calking. The compound shall be driven into the joint groove with sufficient pressure to force out all air and to solidly fill the joint grooves. Calking, where exposed, shall be free of wrinkles and shall be uniformly smooth. Calking around all openings in masonry shall include the entire perimeter of each opening. Upon completion of the calking, any calked joints not entirely filled shall be roughened and filled as specified and the surface coated smooth.

(e). Cleaning. The surfaces of all materials adjoining calked joints shall be cleaned of any smears of compound or other soiling due to the calking application.

TP-12-07. STONE TRIM.

(a). Stone. Coping, window sills and chimney cap shall be first quality, Indiana Oolitic limestone, of color to be selected, cut to detail, and having standard machine finish on exposed surfaces. Stone shall be cut to detail, out of wind, with surfaces at right angles to each other except where otherwise indicated. Stone shall be shipped crated, and shall be stored so as not to be stained by contact with the ground or otherwise.

(b). Samples. The contractor shall submit eight-inch (8") square samples of both buff and gray stone for acceptance by the Contracting Officer. He shall also furnish cutting and setting drawings for approval, each stone being numbered on both the drawing and the stone itself.

(c). Workmanship. Stone shall be accurately set to line and level by competent stone setters, in full beds of mortar with hard-woodwedges and lead buttons where wedges cannot be removed after mortar has set. The mortar in all face joints horizontal and vertical shall be raked out three-quarters ($3/4$) inch from the face of the brickwork and the remainder of the joint filled with an approved calking compound to match the stone. Except in freezing weather, all stone shall be thoroughly brushed and drenched before setting. All sills and projecting stonework after installation shall be protected from damage during the construction operations as approved by the Contracting Officer.

(d). Mortar. Mortar for setting stone shall consist of one (1) part stainless Portland cement, one and three-quarters ($1-3/4$) parts hydrated lime putty, and five to six (5 - 6) parts of clean, sharp, well graded sand of approved color. Lime putty shall stand forty-eight (48) hours before using.

(e). Damaged Stone. Broken, spalled, patched, stained or otherwise damaged stone shall not be placed in the work and no prominent tool marks shall show.

TP-12-08. WINDOWS AND DOORS.

(a). Scope and Drawings. Windows and doors shall be of the type, design, size and materials as specified and shown on the drawings. The contractor shall submit to the Contracting Officer for approval shop drawings showing all details of doors and windows and fabrication shall not start until the drawings have been approved.

(b). Windows. Windows shall be of steel, of architectural projected type similar and equal to those manufactured by the William Bayley Company, with welded mullions and all accessories, and with ventilators arranged as indicated on the drawings. The outside frame shall be a heavy unequal leg channel not less than one and seven-sixteenths (1-7/16) inches deep. All hardware shall be solid bronze and shall include hinges, cam lock and pole ring on each ventilator. All sash shall be glazed with "A" quality, double-strength, flat-drawn, clear window glass, conforming to the requirements of Federal Specification DD-G-451 for "Glass; Flat for Glazing Purposes", set in approved glazing compound, with spring steel, number 15 $\frac{1}{2}$ wire-glazing clips. Windows shall be thoroughly cleaned, bonderized, and given a thorough priming coat of approved rust inhibitive paint in the shop.

(c). Doors. (1). Doors shall be as indicated on the detail drawings and shall be as located on the plans.

(2). Main entrance door shall be a flush type, sound deadened hollow metal door hung in steel frame. Plates shall be formed and shall be of 18-gauge, double annealed, stretcher leveled furniture steel. Plates shall be rigidly connected and reinforced, and all reinforcement shall be made for all hardware. Frames shall be of 12-gauge steel with mitred and welded corners, and with 14-gauge steel bucks equipped with suitable anchors. Scribe molding for exterior of main entrance doorway shall be 16-gauge steel with mitered and welded corners and secured with concealed fasteners. Doors and exposed parts of frames shall have first-quality baked enamel finish.

(3). Doors to Passageway and Adit door shall be two panel steel doors, of 16-gauge tubing and 16-gauge panels. Corners shall be welded, ground smooth and strongly reinforced, and doors shall be suitably reinforced for hardware. Passageway door shall have a suitable metal astragal.

(4). Transformer room door shall be a standard 2-ply Class B Underwriters' tin clad fire door, with thoroughly kiln-dried white pine core.

(5). Door marked "A" shall be thoroughly seasoned, clear white pine, with 2-1/8 inch thick stiles and rails, and 3/4 inch thick panels as indicated. Stiles and rails shall be mortised and tenoned.

(6). All other interior doors except toilet stall door, which is specified in Paragraph TP-12-09, shall be two-panel, clear, thoroughly-seasoned birch or maple veneered doors with white pine cores, one and three-quarter inch (1-3/4") thick stiles and rails mortised and tenoned together, and with one-half (1/2) inch thick panels. All doors, except as otherwise specified, shall be hung in metal frames as indicated.

(7). Passageway and Adit doors shall have a thorough shop priming coat of an approved rust inhibitive paint. Wood doors shall be treated at the mill with an approved preservative oil.

(8). Door frames indicated on drawings to be metal, except as specified in subparagraph (2), shall be of 14-gauge steel, mitered at corners, welded and ground smooth on exposed surfaces.

Not less than three (3) anchors shall be furnished per side for securing frames to walls, and at the bottom of each jamb angle iron clips shall be provided for fastening to floor. Cover boxes shall be provided in back of all hardware cutouts. Cover boxes shall be reinforced. All work shall be accurately mortised, reinforced, drilled and tapped at the factory to receive the hardware, except that the work required for installation of door checks may be done at the building site.

TP-12-09. TOILET STALL.

Toilet stall shall be 16-gauge, flush panel steel, complete with hardware, panels to be four (4) feet six (6) inches high and one (1) foot above the floor, and shall be similar and equal to the product of the Sanymetal Products Company. The partition, door, parts, head rails and all exposed parts of the stall shall have baked enamel finish of color to be selected by the Contracting Officer.

TP-12-10. RAILING AT STAIR WELL.

The rail at the head of the stair well shall be of steel with tubular steel posts, three-eighths (3/8) inch thick packed panels, and plain rail, similar and equal to the E. F. Hauserman Company, Type "R", thirty-six and one-quarter (36-1/4) inches high. Railing shall be rigidly secured to the curb, and the post at the head of the stairs shall be reinforced to receive pipe rails. All visible parts of the railing, posts, panels, base etc. shall have baked enamel finish of color to be selected by the Contracting Officer.

Over the insulating board, a uniform coating of coal tar pitch shall be mopped at the rate of forty (40) pounds per square covered with four plys of fifteen (15) pound, thirty-six (36) inch tar-saturated roofing felt conforming to Federal Specification HH-F-201, for "Felt; Coal-Tar-Saturated (for) Roofing and Waterproofing", with each ply covered with hot coal tar pitch conforming to Federal Specification R-P-381, for "Pitch; Coal-Tar (for) Mineral-Surfaced Built-Up Roofing, Waterproofing and Dampproofing", Type I. Each layer of felt shall be coated with pitch at the rate of twenty-five (25) pounds per square so that nowhere does felt touch felt. Each sheet shall be lapped twenty-seven and one-half ($27\frac{1}{2}$) inches over the preceding and ends lapped at least six (6) inches. The felt shall be free from wrinkles and buckles. Over the entire surface of the top ply a uniform coating of coal tar pitch, using not less than seventy (70) pounds per square, shall be poured from dippers. While the pitch is hot, not less than four hundred (400) pounds of gravel per square shall be embedded in it. All gravel shall pass a three-quarter-inch ($3/4$ ") square mesh screen, not less than eighty (80) percent shall pass a five-eighths-inch ($5/8$ ") square mesh screen and all shall be retained on a one-eighth-inch ($1/8$ ") square mesh screen. The gravel shall be hard, durable, dry, and free from clay and other foreign matter. Not less than one hundred eighty-five (185) pounds of tar applied at a approximately three hundred fifty degrees (350°) F. shall be used for constructing each square of roofing. The contractor shall furnish an acceptable twenty (20) year guarantee bond of the manufacturer of the roofing materials used.

(b). Roof Drains and Vents. Roof drains shall be three-inch (3") Holt Type 6-LG roof connection or equal, with proper accessories for insulation thickness. Holt Type 6-VM roof connection, or equal, shall be used for passage of vent pipe. All roof connections shall have an auxiliary one inch by one and one-half inch steel angle, set to stop against insulation board, with mitered corners, welded, and assembled as approved by the Contracting Officer. Four (4) pound lead shall be used for flashing vents through roof.

(c). Metal Flashing. All flashing shall be done with sixteen-ounce (16-oz.) roofing temper copper, having a twelve to fifteen (12 - 15) pound coating of lead per 100 square feet applied on both sides of the sheet. Base flashing shall be carried at least three (3) inches under the roofing felt and shall be calked full depth of the reglets in the flashing blocks with lead wool. Counter flashing shall extend through the parapet under the coping stones and shall overlap the flashing blocks at least four (4) inches. Flashing shall be installed around pipes extending above the roof as indicated, and around the chimney, counter-flashing shall be caulked into reglets in the chimney with lead wool.

(d). Fabric Flashing. Flashing shall be installed through masonry walls near ground floor line and over heads and under sills of windows and over doors with two-ply, wire mesh reinforced, asphalt saturated cotton fabric similar and equal to the product of Sandell Mfg. Co., Type S.

TP-12-13. BRONZE LETTERS.

Solid bronze letters of type, size and thickness, indicated composing the word "Bennington" shall be furnished and installed over the main entrance in the east elevation. The letters shall have a polished lacquered finish, and shall be firmly and accurately secured to the masonry with flathead, countersunk, bronze screws, separators and suitable expansion sleeves. Details of the letters and the proposed method of setting shall be submitted for approval to the Contracting Officer. Letters shall be thoroughly cleaned after setting.

TP-12-14. HARDWARE.

All hardware shall be furnished and installed by the contractor. Steel doors shall be reinforced for hardware, and hardware shall be secured to metal doors and frames with machine screws. Templates will be required for all hardware applied to steel and metal frames, hollow metal doors and all other steel or metal work to which hardware is applied. Bolts for securing hinges to tin clad door shall extend through the door. Hardware shall conform to the applicable Federal Specifications and shall be of the Type numbers given below or shall be similar or equal to material identified by catalogue references of various manufacturers. The complete hardware schedule, listing manufacturer's name, catalog number, style and type of hardware proposed for installation shall be submitted to the Contracting Officer for approval.

Requirements for hardware are as follows:

<u>Door A</u>	Set Catalog No. 1035-BL ¹ ₂ -232 complete with 2 cremone bolts Catalog No. 517, similar and equal to Richard-Wilcox Mfg. Co.
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<u>Door B</u>	Butts	1½ pair 4½" x 4½" Fed. Spec. FF-H-116B, Type 2001
	Lock	Mortise cylinder Fed. Spec. FF-H-106, Type 126 - 3 keys
	Knobs	Fed. Spec. FF-H-106, Type 210
	Escutcheons	Fed. Spec. FF-H-106, Type 400, 2 required
	Closer	Fed. Spec. FF-H-121, Type 3000 with hold-open device, size as scheduled in Table I.
 <u>Door C</u>	Butts	1 pair 4" x 4" - Fed. Spec. FF-H-116b, Type 2001
	Lock	Mortise- Fed. Spec. FF-H-106 Type 17-A
	Escutcheons	Fed. Spec. FF-H-106, Type 300 and Type 302.
	Knobs	Fed. Spec. FF-H-106, Type 210.
 <u>Door D Storage</u>	Butts	1 pair 4" x 4" - Fed. Spec. FF-H-116b Type 2001
	Lock	Mortise cylinder - Fed. Spec. FF-H-106, Type 93.
	Escutcheons	Fed. Spec. FF-H-106, Type 300 and Type 302.
	Knob	Fed. Spec. FF-H-106, Type 210
 <u>Door D Closet</u>	Butts	1 pair 4" x 4" - Fed. Spec. FF-H-116b, Type 2001
	Mortise latch	Fed. Spec. FF-H-106, Type 28.
	Roses	Fed. Spec. FF-H-106, Type 330, 2 required.
	Knob	Fed. Spec. FF-H-106, Type 210
 <u>Door E</u>	Butts	3 pairs 4" x 4" - Fed. Spec. FF-H-116b, Type 2001, 1½ pair each leaf.
	Mortise latch	Fed. Spec. FF-H-106, Type 7
	Escutcheons	Fed. Spec. FF-H-106, Type 301
	Bolt	Cremone - Fed. Spec. FF-H-111, Type A-1028
	Knobs	Fed. Spec. FF-H-106, Type 210
 <u>Door F</u>	Butts	3 pairs 4½" x 4½" - Fed. Spec. FF-H-116b, Type 2001 full surface
	Mortise latch	Fed. Spec. FF-H-106, Type 28
	Roses	Fed. Spec. FF-H-106, Type 330, 2 required
	Bolt	Cremone - Fed. Spec. FF-H-111, Type A-1028

Door G Hinges No. DB-434B Reverse Pad Offset strap hinge similar and equal to Richards-Wilcox Mfg. Co., 3 required.
 Lock Mortise cylinder - Fed. Spec. FF-H-106, Type 126 3 keys.
 Closer Fed. Spec. FF-H-121a with hold-open device, Type 3000
 Handle Fed. Spec. FF-H-106, Type 400, 2 required for one leaf.

Adit Door
 Like Door D - Storage

Doors
Recorder Cabinet Butts 2 pair 2 $\frac{1}{2}$ " x 1-3/4" Fed. Spec. FF-H-116b, Type 2021.
 Lock 2 for doors 3/4" thick Fed. Spec. FF-H-106, similar to Type 655.
 Pull Fed. Spec. FF-H-111, Type 1305 - Brass drawer pull.

Locks, Latches and Trim

Locks and latches shall be furnished complete with trim, including pulls, cylinder collars, escutcheons, and other necessary items for installation and operation of the hardware types listed, as specified above or as best suited for the hardware specified or usage required as approved by the Contracting Officer.

Toilet Accessories

Shall be similar and equal to Charles Parker Co. products as listed below:

Paper holder Parker catalog No. 117.
 Mirror 18" x 24" copper backed Parker Cat. 3020.
 Shelf 18" x 5" Parker Cat. No. 118.
 Towel bar 18" long Parker Cat. 122.
 Costume hooks 4 Parker Bros. Cat. 227.
 All metal parts to be brass heavily chromium plated.

TP-12-15. LIGHT IRON.

(a). General. The following items of light iron shall be furnished and installed: welded type pipe rail, stair nosing, clean-out door and frame, inspection well cover and frame, hatch cover and frame.

(b). Material. For specifications of materials and workmanship, see Section 7 "Miscellaneous Metal Items, Equipment and Structures". Anchors on door frames shall be malleable, perforated black iron. Frames shall be mitered, welded and ground smooth on all exposed surfaces.

TP-12-16. HEATING.

(a). General. The contractor shall furnish all labor, materials and equipment necessary for the installation in the equipment building of a complete one-pipe gravity steam heating system, with a fully automatic gun type oil burner. The system shall operate at a pressure of approximately five (5) pounds per square inch gage.

(b). Boiler. (1). The boiler shall be of the rectangular sectional cast iron type, designed for a steam working pressure of fifteen (15) pounds per square inch gage, and shall be enclosed in an insulated steel jacket. The boiler shall be provided with the necessary connections for steam supply and condensate return, and shall be equipped with pressure gage and safety valve, water column with gage glass, not less than two (2) compression gage cocks, and water column and gage glass drain valves of the straight through type.

(2). The boiler shall be designed for automatic oil burning and shall be rated for eight hundred and seventy-five (875) square feet of net installed radiation and shall be similar and equal to boiler Catalog No. 200-5 as manufactured by H. B. Smith Co., Inc.

(3). The boiler shall be equipped with a tankless domestic hot water system, suitable for supplying hot water throughout the year. The boiler shall be connected to the chimney by a 16-gage black iron smoke pipe of size recommended by the boiler manufacturer, and shall be provided with a suitable cleanout to permit cleaning of the smoke pipe without dismantling. The boiler shall be connected to the water supply as shown on the drawing. A three-quarter-inch (3/4") brass blow-off cock shall be installed at the lowest point of the system and the boiler.

(c). Oil Burning Equipment. The fuel oil burning equipment shall include the oil burner, motor ignition equipment, controls, oil storage tanks, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic system. All fuel oil equipment shall be approved by the Underwriters Laboratories, Inc., and shall be installed in accordance with the latest standards of the National Board of Fire Underwriters for the installation of Oil Burner Equipment recommended by the National Fire Protection Association.

(1) Oil Burner. The oil burner shall be of the pressure atomization type, suitable for handling #2 fuel oil. The burner shall be quiet in operation and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall atomize the oil completely, and shall mix it effectively with the air so as to insure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity to produce an undue percentage of excess air with the attendant high stack loss. The oil burner shall

operate without clogging or failure, and shall have sufficient capacity to develop not less than one hundred twenty-five percent (125%) of the specified boiler capacity.

(2). Motor. The motor shall be of the open type provided with thermal overload protection and shall suit the current characteristics indicated on the drawings. The motor shall have sufficient capacity to operate the oil pump and fan in order to develop one hundred twenty-five percent (125%) of the specified boiler rating.

(3). Oil Fired Boiler Controls. The oil fired boiler shall be equipped with the following controls:

a. Room Thermostat with a range between forty degrees, (40°) F. and ninety degrees (90°) F. to be located as directed five (5) feet above the ground floor level on the stairwell partition in the Equipment room;

b. Pressure Limit Control on the boiler;

c. Feed Water Regulator and Low Water Cutoff;

d. Safety Stack Switch;

e. Automatic Draft Regulator, (Barometric type)

f. Immersion type aquastat for summer operation

of domestic hot water system.

(d). Safety Valve. A suitable pop safety valve shall be installed on the boiler and shall be set to open automatically and relieve steam at fifteen (15) pounds per square inch gage. The safety valve shall comply with the latest requirements of the A.S.M.E. Boiler Construction Code.

(e). Pressure Gages. Pressure gages of approved Bourden spring type shall be installed on the boiler and the low pressure steam supply line. All gages shall be installed in such a manner as to be accessible and easily read. Each gage shall have its dial set in an iron case having a baked enamel finish. Gages shall be equipped with either an integral or separate siphon, and shall be connected by means of brass pipe and fittings containing a shut-off cock.

(f). Domestic Hot Water System. A tankless hot water system for year round domestic supply shall be furnished and installed. It shall be similar and equal to Taco-Abbot No. 14 system and shall have sufficient capacity to deliver four (4) gallons per minute of domestic hot water with one hundred degrees (100°) F. temperature rise, when the water in the boiler is maintained at a minimum temperature of one hundred eighty degrees (180°) F. For summer burner operation, the oil burner shall operate to maintain boiler water temperature as called for by an immersion aquastat.

(g). Fuel Tanks. Two (2) standard two hundred seventy-five (275) gallon steel oval fuel tanks complete with magnetic gages shall be located as shown on the drawings. The fill and vent lines shall be black steel pipe with malleable iron fittings. A lock type fill connection shall be provided on the fill line. The oil line from the tank to the burner shall be type "K" soft copper tubing conforming to Federal Specification WW-T-799a, for "Tubing; Copper, Seamless (for Use with Soldered or Flared Fittings)", with flared fittings.

Tubing laid in the fill under the basement floor slab shall be run in a steel conduit with long radius fittings. A weighted lever valve connected to fusible links over oil tanks and burner shall be installed in the discharge line from the oil tanks as shown on the drawing. This valve shall be similar and equal to No. 7 as manufactured by the Walworth Company.

(h). Radiators. Cast iron radiators of sizes shown on the drawings shall be installed in locations indicated. Radiators shall be wall hung type, similar and equal to "Corto", as manufactured by the American Radiator Co. Each radiator shall be equipped with an angle supply valve and siphon air and vacuum valve. Radiator valves shall be similar and equal to Crane No. 112. Air valves shall be similar and equal to Hoffman No. 2 Siphon Air and Vacuum Valve.

(i). Pipe. All heating pipe shall be black steel pipe conforming to Federal Specification WW-P-406 for "Pipe; Steel and Ferrous Alloy (for) Ordinary Uses (Iron Pipe Size)", with standard pattern cast iron fittings conforming to Federal Specification WW-P-501b, for "Pipe-Fittings; Cast-Iron (Screwed) 125- and 250-pound". Pipe shall be installed according to best practice and shall be located as shown on the drawings. Runs shall be parallel to building lines and all pipes passing through any masonry shall be set in sleeves cast in the masonry. Sleeves shall be two (2) pipe sizes larger than the system pipe. All pipes shall be supported not over ten feet (10') apart with adjustable hangers with provision for expansion and contraction. All branches to radiators shall have swing

connections with strong pitch to prevent water pockets. Branches from mains shall be taken from top of mains at ninety degrees (90°) or forty-five degrees (45°). Chromium plated floor plates shall be fitted to all pipes passing through floors. On steam mains, beyond the last runout, a quick vent valve similar and equal to Hoffman No. 75 shall be installed. Pipe for cold water connection shall be standard weight galvanized steel. Fittings for galvanized pipe shall be standard weight galvanized malleable iron, beaded pattern fittings designed for a working pressure of one hundred fifty (150) pounds per square inch.

(j). Protective Painting. All sheet metal items shall receive a coat of protective paint before assembly and/or erection. Pipe hangers, supports and all other uncovered metal work not otherwise specified shall be thoroughly cleaned and given one (1) coat of asphalt varnish.

(k). Material. All material shall conform to Federal Specifications listed in paragraph TP-7-01(b) where applicable, or to the following basic specifications:

(1). Electrical Materials and Appliances. To conform with the requirements of Section 9.

(2). Firebrick. Federal Specification HH-B-671b, for "Brick; Fire-Clay".

(3). Fire-Clay. Federal Specification HH-C-451b for "Clay; Fire, Ground", Grade C.

(4). Iron and Steel Sheets. Federal Specification QQ-S-636, for "Steel; Carbon (Low Carbon), Sheets and Strips."

(5). Metals, Inspection. Federal Specification QQ-M-151a, for "Metals; General Specification for Inspection Of."

(6). Nipples; Pipe, Steel and Wrought Iron. Federal Specification WW-N-351 for "Nipples, Pipe; Brass, Steel and Wrought-Iron."

(7). Pipe Fittings, Cast Iron (Threaded.) Federal Specification WW-P-501b for "Pipe Fittings; Cast Iron (Screwed) 125- and 250-pound."

(8). Pipe Fittings, Malleable Iron. Federal Specification WW-P-521b, for "Pipe Fittings; Malleable-Iron (Screwed), 150-Pound."

(9). Pipe, Steel, Seamless and Welded, Black and Zinc Coated. Federal Specification WW-P-406, for "Pipe; Steel and Ferrous-Alloy (for) Ordinary Uses (Iron-Pipe Size)."

(10) Pipe Threads. Federal Specification GGG-P-351a, for "Pipe-Threads; Taper (American-National)".

(11). Unions; Malleable Iron or Steel. Federal Specification WW-U-531 for "Unions; Malleable-Iron or Steel, 250-Pound."

(12). Valves, Brass or Bronze; Angle and Globe 150 lb. Federal Specification WW-V-51a for "Valves, Bronze; Angle, Check and Globe, 125- and 150-Pound, Screwed and Flanged (for Land Use)."

(13). Valves, Gate, 125 lb. Threaded. Federal Specification WW-V-58 for "Valves, Cast-Iron, Gate; 125 and 250-Pound; Screwed and Flanged (for Land Use.)"

(14). Varnish, Asphalt. Federal Specification
TT-V-51a for "Varnish; Asphalt."

(15). Mechanical Equipment. All major items of mechanical equipment shall be the latest standard catalog products of reputable manufacturers. Where two (2) or more items of the same kind of equipment are required, they shall be the products of a single manufacturer.

(1). Catalogues and Descriptive Data. Within thirty (30) days after the award of the contract, the contractor shall submit to the Contracting Officer for approval, catalogues and descriptive data of the materials and equipment the contractor proposes to use for the following:

- (1) Boiler and Fittings;
- (2) Oil Burner;
- (3) Oil Burner Controls;
- (4) Radiators and Valves, and
- (5) Tankless Type Water Heater and all necessary fittings.

(m). Hydrostatic Test. The heating system shall be tested hydrostatically, and shall be proved tight under a gage pressure of forty (40) pounds per square inch.

(n). Cleaning of Steam Heating Systems. (1). The boiler shall be blown out under pressure, and after boiler has cooled it shall be partly filled and flushed out several times, until all grease and impurities have been removed to the satisfaction of the Contracting Officer. The use of soda, or any alkali, vinegar or any acid is not allowed. An insoluble compound recommended by the manufacturer of

the boiler shall be used.

(2). The system shall be operated for a cleaning period of three (3) to five (5) days, as directed by the Contracting Officer. The condensate during this period shall be disconnected and wasted to the nearest drain, or as directed by the Contracting Officer. This operation shall be executed under the supervision of a competent representative of the contractor.

(c). Operating Test. At the end of the cleaning period the return connection shall be made and the system shall then be operated for a test to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than six (6) hours for the system, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities and labor required to properly conduct the tests, shall be provided by the contractor, and all fuel, water and electricity required will be furnished by the government.

TP-12-17. PLUMBING AND SEWAGE DISPOSAL SYSTEM.

(a). General. The contractor shall furnish and install the plumbing and sewage disposal system as shown on the drawing or specified herein, complete and ready for service, including all plumbing fixtures, hot water storage tank, supply, waste and vent piping, roof drainage, floor drainage, septic tank with influent and effluent piping and disposal drains.

(b). Materials. All material shall conform to Federal Specifications listed in paragraph TP-7-01(b) where applicable.

(c). Plumbing Fixtures. The contractor shall install one lavatory and one water closet similar and equal to products of Standard Sanitary Corp., as follows:

(1) Lavatory: Lucerne - F369 H, 20" x 18", wall hung, with chain and stopper, three-eighths inch ($\frac{3}{8}$ ") supply pipes with stops and one and one-quarter inch ($1\frac{1}{4}$ ") P trap, all exposed metal, chromard.

(2) Water Closet: Siacto - F-2180 with vitreous china tank, seat and cover No. 600 Service sink in closet: Argo - P-7710E 24" x 20" with trap P7783, all exposed metal, chromard.

(d). Piping Installation. (1). All piping shall be installed according to best practice and shall be laid out with proper fittings to make lines run parallel with building lines and close to walls and ceilings. Pipe supports shall be provided in sufficient number to prevent sagging of the pipe. Hangers for piping hung from ceilings shall consist of inserts set in the concrete with steel or iron clamps around the pipes. Only supports approved by the Contracting Officer shall be used. Where pipes pass through floors, walls or ceilings, chromium plated plates shall be installed. Plates shall be at least one and one-half ($1\frac{1}{2}$) inches larger than the diameter of the pipe and shall be fastened securely in place in an approved manner.

(2). Cast iron or wrought iron pipe sleeves of proper size to allow one-quarter inch ($\frac{1}{4}$ ") space shall be provided for all pipes passing through basement walls. Space between pipe and sleeve shall be packed with oakum to within one (1) inch of both faces of the wall and the remaining space filled with an asphalt mastic compound. All sleeves shall be cast in place as the masonry work progresses.

(e) Water Piping.-- All water pipe to plumbing fixtures, hot water storage tank and boiler shall be hard copper tubing, conforming to Federal Specification WW-T-799a, for "Tubing; Copper, Seamless (for Use With Soldered or Flared-Fittings)," type L, with sweat fittings and shall be of sizes shown on the drawing. Valves shall be all brass conforming to Federal Specification WW-V-58.

(f) Soil, Waste, Vent and Drain Piping.-- All soil, waste and drain pipe, two (2) inches and larger, shall be extra heavy cast iron soil pipe with soil pipe fittings of the same make and grade as the soil pipe. Waste pipe smaller than two (2) inches shall be schedule 40, genuine wrought iron, galvanized inside and outside, with standard, screwed cast iron drainage fittings. All vent pipes shall be galvanized steel pipe with standard screwed cast iron fittings. All joints between hub and spigot pipe and fittings shall be calked tight with picked oakum and pig lead. All calking lead shall be new, pure, soft virgin lead of the best quality, similar and equal to that processed by the National Lead Company. Joints between hub and spigot pipe and threaded pipe shall be made in the same manner as all cast iron joints except that the end of the threaded pipe shall have a cast iron conversion spigot screwed on the end and centered within the cast iron hub. After oakum has been compacted so as to leave a depth of not less than one (1) inch for the lead, the joint shall then be filled with molten lead in one (1) continuous pour from the ladle and calked to form a neat and tight joint. Cast iron cleanouts shall be calked into hubs of fittings where shown on the drawing.

Cleanout at toilet floor shall be brass, flush with finished floor. All changes in pipe size shall be made with reducing fittings. All changes in direction shall be made by the appropriate use of forty-five (45) degree wyes, long sweep quarter bends, sixth, eighth or sixteenth bends, except that sanitary tees may be used on vertical stacks, and short quarter bends or elbows may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical, and on the discharge from the water closet. Horizontal soil and waste pipes shall be given a grade of one-quarter ($1/4$) inch per foot of pipe. A cleanout shall be installed at the foot of the vent stack and elsewhere as shown on the drawing. Cleanouts on hub and spigot pipe shall be a long sweep $1/4$ bend. A standard weight cast iron ferrule with countersunk trap screw cover shall be calked into hub of fitting. Cleanouts on threaded pipe shall be cast iron drainage "T" pattern ninety (90) degree branch fitting with standard weight iron screw plugs of the same size as the pipe. Each fixture connected to the drainage system shall be equipped with a trap. The traps shall be installed as near to the fixture as practicable.

(g) Septic Tank. - (1) A septic tank shall be installed in the location shown on the drawings. It shall be connected to the sanitary piping from the equipment building and shall have an effluent disposal system of four inch (4") farm tile as shown on the drawing.

(2) The septic tank shall have a working capacity of three hundred (300) gallons and shall be similar and equal to Kaustine Standard Septic Tank No. 63 as manufactured by the

Kaustine Company of Perry, N. Y. The effluent line from septic tank to angle point at disposal drains shall be four inch (4") extra heavy cast iron soil pipe with Leadite joints or equal. Effluent line from angle point to disposal drains shall be four inch (4") salt glazed vitrified clay pipe with double wye branches at disposal lines. Joints shall be calked with oakum and cemented. Disposal laterals shall be four inch (4") round farm drainage tile, laid with open joints spaced one-quarter (1/4) inch apart by galvanized tile connectors placed over top half of pipe.

In placing selected gravel and dumped rock fill over disposal field, care shall be taken to avoid damaging or displacing the pipe in the laterals.

(h) Tests.-- All water pipe shall be tight when tested with a hydrostatic pressure of one hundred (100) pounds per square inch. All soil, waste and vent piping shall be tight when filled with water to the top of the vent.

(i) Guarantee.-- The following equipment to be furnished under this section of the specification shall be guaranteed for a period of one (1) year from the date of final acceptance thereof against defective materials, design and workmanship:

Boiler

Oil Burner and Motor

Oil Burner Controls

Water Heater

Lavatory

Water Closet

Septic Tank

Fuel Tanks

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

TP-12-18. PAINTING.- Painting shall be in conformance with Section 14.

TP-12-19. ELECTRICAL WORK.- Electrical work shall be installed as specified in Section 9.

TP-12-20. PAYMENT.-

(a) Payment will be made at the contract lump sum price for Item No. 53, "Equipment Building Superstructure," for furnishing all labor and materials and performing all work not specifically called for under other pay items necessary to construct the equipment building superstructure as herein specified and indicated on the drawings.

(b) Included for payment under Item 53 is the following work below the ground floor level and outside the building lines: chimney, heating, plumbing, waste disposal system, water piping, doors to Gate Chamber Passageway and doors at the Adit Entrance in the West Abutment, and flashing, roofing and cornice on the Adit in the West Abutment.

(c) Work in the equipment building superstructure to be paid for under other items include the following:

- (1) All electrical work - Item No. 44
- (2) Gasoline - electric standby unit and fuel supply system - Item No. 41.
- (3) Oil pumps and equipment - Item No. 43.
- (4) Monorail hoist - Item No. 40.
- (5) Stair treads, pipe railing, and float well frame and cover - Item No. 31.
- (6) Cement - Item No. 28.

SECTION 13 - MAINTENANCE BUILDING (ITEM NO. 54)

TP-13-01. SCOPE OF WORK. The contractor shall furnish all labor and materials and do all work required to satisfactorily construct the maintenance building as shown on the drawings and as specified, and shall construct outside the building limits a complete sewage disposal system and a complete water supply piping system to a point indicated on the drawings outside the foundation wall of the Equipment Building and for connection to the operator's residence.

TP-13-02. EARTHWORK. (a) Excavation shall be performed in accordance with the requirements of Section 4.

(b) ~~Backfill~~ within the building limits shall meet the requirements of paragraph TP-5-07.

(c) Gravel walks of dimensions shown on the drawings shall be constructed of approved selected gravel according to the requirements of TP-5-08.

TP-13-03. CONCRETE. All concrete in the Maintenance Building shall conform to the requirements of Section 6 using three-quarter inch ($3/4$ ") maximum size aggregate.

TP-13-04. MASONRY. (a) Scope of Work. The contractor shall furnish all labor and materials and do all work, except that specifically included under other sections, required to satisfactorily construct the masonry work as shown on the drawings or specified. Work to be done under this section shall include all concrete block, brick work and precast window sills and chimney cap.

(b) Material. (1) Concrete Block. Concrete block shall be of the sizes indicated, shall have plain faces, smooth finish, and shall conform in compressive strength, absorption and moisture content to the requirements of Federal Specifications SS-C-621, for "Concrete Units; Masonry, Hollow", Type I. Special shapes and sizes of blocks, such as jamb blocks, required to properly complete the building as indicated shall be included.

(2) Brick. Brick shall be Grade H, sandstruck body brick having smooth, uniform texture, with true faces, and sharp edges free from chipping and spalls, and shall meet the requirements of Federal Specification SS-B-656, for "Brick; Building (Common), Clay."

(3) Flue Lining. Chimney flue lining shall be first grade, standard, fire clay flue lining of size indicated, and shall include a thimble of proper size for the boiler flue.

(4) Precast Concrete, Window Sills and Chimney Cap. Sills and cap shall meet the requirements of Federal Specification SS-S-721, for "Stone; Architectural, Cast", Type I. Sills and cap shall have all exposed surfaces free from waves, projections or depressions, and all surfaces shall be at right angles to other surfaces except where otherwise required. Finish shall be smooth. Color shall match that of wall blocks as closely as possible. All sills and cap shall be thoroughly seasoned for at least twenty-one (21) days before being delivered. Sills and caps shall be suitably reinforced.

(5) Mortar. Mortar shall be mixed in the following

proportions:

1 Part Portland cement

1-3/4 parts lime putty

6 parts (more or less) of sand

The minimum quantity of water for a workable mix shall be used.

Cement shall be an approved, standard portland cement. Sand shall be clean, sharp, well graded sand free from loam and silt, none of which will be retained on a quarter inch ($\frac{1}{4}$ ") mesh screen and ninety to one hundred percent (90 - 100%) shall be retained on a hundred (100) mesh sieve. Samples of sand shall be submitted to the Contracting Officer for approval if required.

(6) Lime. Lime shall be hydrated lime conforming to Federal Spec. SS-L-351 for "Lime; Hydrated, (for) Structural Purposes", Type F or M. Lime putty shall be prepared by mixing the hydrated lime with water to form a putty and stored with reasonable care to prevent evaporation of water for at least twenty-four (24) hours before use.

(c) Laying Block and Brick. (1) All masonry shall be laid accurately, in courses as indicated on the drawings, to lines that are plumb, level, straight and true. Each unit shall be laid in a full bed of mortar, shall be shoved into place and all joints shall be entirely filled with mortar. Horizontal and vertical joints shall be of the same width and shall be weathered for exterior work and flush for interior work. All concrete block shall be installed in accordance with the standards contained in the handbook entitled "Facts about Concrete Masonry" published by the National Concrete

Masonry Association. Jams shall be constructed at right angles to faces of walls.

(2) Windows and door frames, clean-out door frame, lintel, anchors, bolts, window sills and chimney cap shall be built in to the masonry, reglets shall be left in brick work for flashing.

(3) Tops of unfinished walls shall be protected from the weather. Masonry shall not be laid in freezing weather, except with the consent of the Contracting Officer, and in accordance with his directions.

(4) Except where concrete anchorages are called for on drawing, exposed cores in the top layer of masonry blocks in walls shall be blocked up with paper to approximately two (2) inches below the top of the block and the remaining space filled with cement mortar.

(5) At the conclusion of the masonry work, all exposed masonry joints shall be pointed with a concave tool to produce continuous contact between masonry and mortar and thoroughly cleaned with fiber brushes and soap powder, and thoroughly rinsed. Where mortar stains are persistent, a little fine sand may be used in rubbing.

TP-13-05. CARPENTRY AND MILL WORK. (a) General. (1) The contractor shall furnish all labor and materials and do all work except that specifically included under other sections, required to satisfactorily complete all carpentry and mill work as shown on the drawings or specified. Work to be done under this section shall include roof framing, rafters, strapping, furring, stud partitions,

windows, doors, cornice, counters, scuttles, siding above top of concrete block, and all other carpenter work required to complete the structure.

(2) Lumber shall be subject to requirements of Federal Specification MM-L-751c and MM-L-736 and shall bear official grade mark of the Inspection Bureau or Association under whose rules it is graded. Finish sizes shall conform to Yard Size Standards and mill finish shall conform to American Lumber Standards SPR-R16-39.

(3) Moisture Content.- The moisture content of lumber shall conform to the seasoning requirements of the grading rules of the inspection bureau or association under which it is purchased, except that for doors, door frames, sash, window frames, and other finish work, the moisture content shall not exceed fifteen (15) percent, and for common boards for sheathing, and work of like nature, the moisture content shall not exceed nineteen (19) percent.

(b) Material and Workmanship. (1) Rafters, joists, braces, hangers, scuttle framing, and all plate members shall be Coast Region, Select Structural Grade Douglas Fir, or Structural Grade Southern Yellow Pine or spruce of dimensions indicated on the drawings. All finish and trim shall be B or C select.

(2) All truss members shall be securely connected with three-eighths (3/8) inch bolts and washers in number and locations shown.

(3) All plate members shall be securely spiked to

each other, and plate shall be securely bolted to concrete blocks as indicated. All rafters shall be cross bridged with one inch by two inch (1"x2") cross bridging once in each span.

(4) The roof and wall boarding shall be matched, yellow pine, or Douglas Fir, 25/32 inch thick, six (6) inches to eight (8) inches wide. Boarding shall be laid with staggered joints, shall be nailed to each rafter, or stud, with two (2) eight-penny (8d) nails to each six (6) inch board and three (3) eight-penny (8d) nails to all boards over six (6) inches wide. Boarding shall not be driven up too tight. A three-quarter (3/4) inch eave strip shall be provided and installed at all eaves.

(5) Scuttle covers and cat walk boarding shall be like that specified for roof.

(6) Strapping and furring shall be one inch by two inch (1"x2") fir, yellow pine or spruce, sixteen (16) inches on center, firmly nailed in place.

(7) All exposed parts of the cornice and rakes shall be of thoroughly seasoned, clear white pine, with members of the sizes and shapes indicated. The cornice and rakes shall be nailed securely, with all mitres and joints buttered with white lead.

(8) Stud partitions shall be built of fir, yellow pine, spruce or other sound and suitable lumber and shall be of sizes indicated. Studs shall be doubled at jambs and heads of openings. Shoes shall be secured to the floor, and studs to walls, and there shall be diagonal bracing at ends of long runs of studding. Both sides of all stud partitions, except in the shower stall, shall be

covered with an approved plasterboard one half ($\frac{1}{2}$) inch thick for their full height. There shall be a wood chair rail three (3) feet above the floor except in the toilet room, and one inch by six inch (1"x6") white pine baseboards.

(9) Gypsum board shall be three eighths ($\frac{3}{8}$) inch thick, square edged, paper covered gypsum board, "Sheetrock", the product of the United States Gypsum Company, or approved equivalent. Boards shall run from floor to top of partition in one piece as far as possible. Gypsum board shall be four feet by twelve feet (4'x12') as far as possible on ceilings.

(10) Cement asbestos board shall be one half ($\frac{1}{2}$) inch thick, "Transite" board, the product of Johns-Manville, or equivalent. Boards shall be in one piece from floor to ceiling in shower.

(11) Windows throughout shall be double hung. They shall have clear, thoroughly seasoned white pine sash of No. 2 or better sash cutting stock, frames, casings, sills, stools, aprons, stop and staff beads, of patterns and sizes indicated on the drawings, hard pine pulley stiles full one (1) inch thick, hard pine parting beads and metal parting strips between weights. Pulleys shall be two and one half ($2\frac{1}{2}$) inches in diameter, ball bearing, with bronze plated face plates. Weights shall be of cast iron of size and weight to perfectly balance the sash, and shall be hung on Sampson Spot Cord, Silver Lake A Cord, or equivalent cord of proper size.

(12) Frames and louvers shall be of clear, thoroughly seasoned white pine of sizes and detail indicated. Louvers shall be let into jambs. Door shall be of fir plywood. Bronze wire screening

shall be No. 16, conforming to the requirements of Federal Specification RR-C-451a for "Cloth, Wire Screen", Type C.

(13) All exterior doors shall be of clear, thoroughly seasoned white pine, shall be of types and sizes indicated on drawings and, except for large garage doors, shall be hung in pine frames of same grade as for doors. Stiles shall be one and three quarters ($1\frac{3}{4}$) inches thick, and panels shall be three-ply. Stiles and rails shall be mortised and tenoned. The large garage doors shall be an overhead type of wood doors with six (6) panels, four (4) sections high, stiles and rails one and three quarters ($1\frac{3}{4}$) inches thick, wood panels seven sixteenths ($\frac{7}{16}$) inches thick, with the third section from bottom glazed with double strength glass. Each sliding door shall be a complete unit with sloping track, guides, brackets, hangars, graduating hinges and other operating and finish hardware including locking device with cylinder locks. The doors and hardware shall be similar and equal to Model #45 manufactured by the Overhead Door Corp. Details of assembly with operating hardware and setting drawings shall be submitted to the Contracting Officer for approval.

(14) Interior doors, except Kalamein doors, shall be first quality Douglas fir doors of types and sizes indicated, and shall be hung in fir frames. Stiles and rails shall be one and three eighths ($1\frac{3}{8}$) inches thick, panels shall be three (3) ply. Doors designated as "D" doors shall be Kalamein doors one and three quarters ($1\frac{3}{4}$) inches thick, having dry white pine cores free from loose knots, sap or dry rot. Stiles and rails shall be mortised and tenoned. Cores

shall be covered with 26 gauge Kalamein iron applied to produce smooth, close fitting surfaces without waves or other imperfections. Glueing shall be done with high grade waterproof glue. Joints in metal shall be soldered and scraped smooth. All edges shall have metal turned in, or shall otherwise be made smooth and free of raw edges. Doors shall have a thorough shop priming coat. Kalamein doors shall be hung in 14 gauge metal frames. Door openings designated "A", "B" and "C" shall have one and one eighth ($1\frac{1}{8}$) inch thick screen doors, of clear, dry white pine, mortised and tenoned, and screened with No. 16 mesh copper wire netting.

(15) The toilet room shall have a cement asbestos board dado four feet (4'-0") high with gypsum board above except in the shower stall where asbestos board shall be the full height of the partition.

(16) Ceilings shall be covered with three-eighths inch ($\frac{3}{8}$ ") gypsum board. The inside face of the wood plate shall be covered with the same kind of board as adjacent ceiling. Joints between ceiling boards shall be filled and leveled off with an approved plastic material.

(17) Clapboards shall be clear, well seasoned white pine, Douglas fir or red cedar, showing four and one half ($4\frac{1}{2}$) inches to the weather. The exterior stud walls shall have the wood sheathing covered with asphalt saturated building felt prior to installing clapboards.

(18) Straight grained, well seasoned birch or maple seat one and one eighth ($1\frac{1}{8}$) inches thick, supported on seven

eighths inches by three and one half inches ($7/8" \times 3\frac{1}{2}"$) cleats in the shower stall. Curtain rods shall be chromium plated steel or other polished metal, one (1) inch in diameter, strongly supported where indicated at the shower stall.

(19) The counter in the Garage shall be two (2) inch matched and well jointed Douglas fir or yellow pine plant, left smooth and in good condition to receive linoleum. The counter shall be supported on fir or yellow pine framing as indicated. The shelves below the counters shall be of the same material as the counter tops, but will not be covered with linoleum. The drawers shall have fir or yellow pine fronts, maple sides, plywood back and bottom. The sides and bottom shall be let into the fronts, and the back and bottom shall be let into the sides. The drawers shall be strongly constructed, and shall be fitted so that they can be easily operated. The linoleum shall be plain, brown one eighth ($1/8$) inch battleship linoleum, well cemented to plank top, and there shall be an approved standard type edge strip screwed to the edge of the counter. Linoleum shall conform to Emergency A items to Federal Specifications LLL-L-351a for "Linoleum; Battleship".

(2) One (1) inch fir or yellow pine shelving shall be installed where indicated at the west end of the Garage, and shall be supported on fir or yellow pine studs and cleats. The plate above the studs shall be well secured to the joists and the bottom of the studs shall be secured to the floor with "sign" dogs.

(21) The Rotap housing shall be constructed of two inch by three inch ($2" \times 3"$) fir, or yellow pine, and one half inch ($\frac{1}{2}"$) plywood on both sides of walls, doors and top. The top shall

be of construction similar to walls. Uprights shall be secured to concrete slab below. Door shall be in two (2) parts, one part within the other as indicated. The voids in top, sides and doors shall be filled completely with rockwool or approved material of equal insulating value. Plywood shall be "Douglas Fir, sound, two (2)-sides, of dimensions and thicknesses indicated. It shall be laminated, of alternating grain, glued with water proof adhesive and subjected to high pressure.

(22) Window screens shall have clear well-seasoned white pine frames two (2) inches wide, full seven eighths (7/8) inch thick, rebated and equipped with quarter round molding well bradded in place. The screens shall cover the entire area of all window openings, and shall be held in place with round head blued screws. Screen cloth shall be 16 mesh copper wire securely tacked and drawn tight and smooth. Joints of frames shall be accurately mitred and strongly nailed.

TP-13-06. ROOFING AND FLASHING. (a) General - The contractor shall furnish all labor and materials and do all work, except that specifically included under other sections, required to satisfactorily complete the roofing and flashing as indicated on the drawings and specified. Work to be done under this section shall include all roof covering and flashing.

(b) Material and Workmanship. (1) Shingles shall be first-quality, plain, black, thick butt, mineral surfaced, asphalt, strip shingles, conforming to the requirements of Federal Specification SS-R-521, for "Roofing and Shingles; Asphalt-Prepared, Mineral Surfaced", Type II, showing five (5) inches to the weather and having three-inch

(3") headlap.

(2) Nails shall be one-inch (1") #11 wire galvanized iron nails having heads seven sixteenths ($7/16$) inch in diameter.

(3) Felt shall be slater's tar saturated felt, weighing thirty (30) pounds per roll, containing five hundred (500) square feet.

(4) Copper shall be sixteen ounce (16 oz.) lead coated on both sides, with a total weight of twelve to fifteen (12-15) pounds of lead per one hundred (100) square feet. Copper for flashing shall be roofing temper, for gutters and conductors, cornice temper.

(5) The roofs shall be made tight as early as possible, but no roofing materials shall be laid until roof decks are smooth, dry and free from loose materials. The roof boarding shall be covered with the felt specified above, lapping all joints at least two (2) inches, and tacking the felt securely in place, using metal discs under the nail heads. Over the felt the shingles shall be nailed firmly, accurately to line, with a minimum head lap of two (2) inches, starter wood shingles shall be provided at eaves; ridge shingles shall be lapped well and bedded in an approved roofing cement.

(6) Gutter shall be installed at south side of Garage roof and over the main entrance. The gutter shall be five (5) inch, double bead, half-round, sixteen (16) ounce, lead coated, cornice temper copper gutter, reinforced at beads with three eighths ($3/8$) inch round brass rods, as indicated. The gutter shall be supported by adjustable brass hangers of type shown on the drawings and

the hangers shall be spaced not more than thirty (30) inches apart.

(7) The conductor shall be a three-inch (3") lead-coated copper, cornice temper, corrugated conductor, with gooseneck of the same material, well sweated to the gutter. The conductor shall have an elbow at the bottom, and shall be securely fastened to the building wall with two-inch (2") wide lead-coated copper straps.

(8) Step flashing shall be installed at the chimney and at the junction of the Garage roof and the east wall of the main building. The flashing shall be carried at least six (6) inches under the roof covering and shall be caulked into reglets in the masonry with lead wool. A copper cricket shall be provided at the chimney. Copper flashing shall be installed in the following locations; under the sill of louvers, over the finish board at the bottom of clapboarding, over the head casing of louvers and over the head of Door "C". Two-ply, wire mesh reinforced, asphalt saturated cotton fabric flashing, the product of Sandell Mfg. Co. or equivalent, shall be installed in the following locations: under the pre-cast window sills and over the window head in the east wall of the Storage Room. Flashing shall be installed and made tight around the plumbing vent pipe, carrying the flashing at least four (4) inches under the roofing and at least ten (10) inches up the pipe. Threaded recess roof couplings shall be used to form counter-flashing for vent pipe.

TP-13-07. CALKING. (a) General. The contractor shall furnish all labor and materials and do all work, except that specifically included under other sections, required to satisfactorily complete the calking as shown on the drawings or specified. Work to be done under

this section shall include calking around all windows and exterior doors except large garage doors.

(b) Materials and Workmanship. The calking compound shall be an approved plastic material, light in color, of weatherproof and waterproof qualities. It shall be stainproof to adjacent materials, shall not be affected by long exposure to extremes of outside temperature, and shall not sag, crack or become brittle and shall remain plastic indefinitely, and shall not adversely affect paint applied to the mastic. The calking compound shall be applied with a pressure gun wherever possible. Joints shall be completely filled with compound and the calking shall be neatly finished. All joints shall be clean and dry when compound is applied. Staff beads shall be carefully removed before compound is applied and neatly and firmly replaced afterwards. Materials and workmanship shall conform to the requirements of paragraph TP-12-05.

TP-13-08. GLASS AND GLAZING. (a) General. The contractor shall furnish all labor and materials and do all work, except that specifically included under other sections, required to satisfactorily performed glazing. Work to be done under this section shall include glazing of all windows and doors.

(b) Materials and Workmanship. (1) Flat glass for glazing shall conform to the requirements of Federal Specification DD-G-451 for "Glass; Flat (for) Glazing Purposes." Glass throughout, except in the doors in the north elevation, and the window in the toilet room, shall be type B quality, double-strength, flat drawn window glass. The window in the toilet room shall be glazed in both sash with Type "D" obscure glass, "Syenite" or equivalent. Doors and windows in the

oil and paint storage and heater rooms shall be glazed with Type E, one quarter ($\frac{1}{4}$) inch thickness clear polished wire glass.

(2) Glazing compound shall be "Tremglaze" mastic compound, manufactured by Tremco Manufacturing Co. or equal.

(3) All glass shall be secured with glaziers points. All glass shall be bedded in glazing compound and all lights shall be sprigged firmly into place. After bedding glass firmly and thoroughly it shall be puttied in, leaving the compound smooth, straight and even with the rebate. Obscure glass shall be set with smooth surface to exterior, and surface design in one direction.

TP-13-09. LIGHT IRON. (a) General.- For the proper completion of the Maintenance Building, the following items of light iron shall be furnished and installed: channel iron jambs of garage doors, and metal frames for Kalamein doors, angle iron in floor at garage doors, cleanout door and frame in chimney, lintel at east window of Storage Room, bolts, nuts, washers and anchors. Metal frames for Kalamein doors shall be 14 gauge and shall be similar to those specified under paragraph TP-12-08 except as modified by detail drawings.

(b) Material. For specifications of materials and workmanship, see Section 7, "Miscellaneous Metals." Anchors on channel iron door frames shall be malleable, black iron, perforated. Channels at jambs of garage doors shall be mitered, welded, and ground smooth at corners.

TP-13-10. HARDWARE. (a) General.- All hardware shall be furnished and installed by the contractor. Hardware on Kalamein doors

shall be bolted through doors and secured to channel frames with machine screws. Hardware shall conform to Federal Specifications specified in paragraph TP-12-14, and shall be of the types listed below. A complete list of the hardware proposed for installation, showing manufacturer, catalog number and type shall be submitted to the Contracting Officer for approval.

Doors A (Two)

Butts 3 pairs $4\frac{1}{2}$ " x $4\frac{1}{2}$ " Fed. Spec. FF-H-116b, Type 2001.

Lock Mortise cylinder Fed. Spec. FF-H-106 No. 126, 3 keys

Knob One Fed. Spec. FF-H-106, Type 210

Escutcheons ~~and~~ Fed. Spec. FF-H-106, Type 400, 2 required

Hold-open hooks 2 bronze with long standards Fed. Spec. FF-H-111, Type A1176A-4"

2 pair Spring hinges (screen door) Fed. Spec. FF-H-116b, Type 2301A

Screen door Pulls, 2 - $4\frac{7}{8}$ " Fed. Spec. FF-H-111, Type 1269

Bolt 31 cremone - Use Richard-Wilcox Bolt specified in paragraph TP-12-14

Door B

Butts 12 pair $4\frac{1}{2}$ " x $4\frac{1}{2}$ " Fed. Spec. FF-H-116b, Type 2001

Spring ~~and~~ hinge 2 pair (screen door) Fed. Spec. FF-H-116b, Type 2301A

Lock Mortise Cylinder Fed. Spec. FF-H-106, Type 126, 3 keys

Knob One Fed. Spec. FF-H-106, Type 210

Escutcheon

handle

Fed. Spec. FF-H-106, Type 400, 2
required

Catch (screen door) Sargent No. 6868TC

Hold-open hook one bronze with long standard
Type A 1176A

Door C

Butts 12 pair $\frac{1}{4}$ " x $\frac{1}{4}$ " Fed. Spec. FF-H-116b,
Type 2001

Lock Mortise cylinder Fed. Spec. FF-H-106,
Type 88 3 keys

Escutcheon 2 Fed. Spec. FF-H-106, Type 300A

Knobs 2 Fed. Spec. FF-H-106, Type 210

Spring
Hinges $1\frac{1}{2}$ pair (screen door) Fed. Spec. FF*
H-116b, Type 2301A

Doors D (Two)

Butts $1\frac{1}{2}$ pair $\frac{1}{4}$ " x $\frac{1}{4}$ " Fed. Spec. FF-
H-116b Type 2001 except full sur-
face for bolting through door

Lock Mortise
cylinder Fed. Spec. FF-H-106, Type 88

Escutcheons One type 300 and one Type 301

Knobs 2 Fed. Spec. FF-H-106, Type 210

Closer Fed. Spec. FF-H-121A, Type 3000,
Size IV

Door E

Butts 1 pair $\frac{1}{4}$ " x $\frac{1}{4}$ " Fed. Spec. FF-H-
116b, Type 201 $\frac{1}{2}$ P

Latch 1 Fed. Spec. FF-H-116b, Type 28

Roses 2 Fed. Spec. FF-H-106, Type 300

Knobs 2 Fed. Spec. FF-H-106, Type 210

Doors F (Four)

Butts 1 pair $4\frac{1}{2}$ " x $4\frac{1}{2}$ " Fed. Spec.
FF-H-116b, Type 2014 $\frac{1}{2}$ P

Latch 1 Fed. Spec. FF-H-116b, Type
28

Roses 2 Fed. Spec. FF-H-106, Type 300

Knobs 2 Fed. Spec. FF-H-106, Type
210

Door G

Butts 1 pair 3" x 2" Fed. Spec. FF-H-
116b, Type 2021B

Bolt 3" long and keeper inside

Pull 4-7/8" Fed. Spec. FF-H-106, Type
1269 outside

Sash
Fasten-
ers Fed. Spec. FF-H-111, Type 1139

Scuttle
Hinges 1 pair 4" x 4" Fed. Spec. FF-
H-116b Type 2029A

Louvers 1 pair butts 3" x 2" Fed. Spec.
FF-H-116b, Type No. 2029A
brass hook and 2 eyes each hook
(open and closed)

Drawer
Pulls 2 per drawer Fed. Spec. FF-11-
111, Type No. 1296

Rotap Housing Doors

1 pair 3" x 3" butts Fed. Spec.
FF-H-116b Type 2017

1 pair 3" x 3" spring hinge Fed.
Spec. FF-H-116b, Type 2301A

3 Cupboard catch Fed. Spec.
FF-H-111 Type 1082

Sash
Lifts Flush 1-3/4" x 3-1/8" FF-H-111,
Type 1208

Toilet Accessories Charles Parker
Co. or equivalent

Paper Holder Parker catalog No. 117

Mirror 18" x 24" copper backed
Parker catalog No. 3020

Shelf 18" x 8" x $\frac{1}{4}$ " Parker catalog
No. 118

Towel bar 18" long Parker catalog
No. 220

Costume hooks 6 Parker catalog
No. 227, all metal parts of ac-
cessories to be brass heavily
chromium plated

(b) Locks, Latches and Trim. Locks and latches shall be furnished complete with trim, including pulls, cylinder collars, escutcheons and other necessary items for installation and operation of the hardware types listed. Outside doors shall be master-keyed.

TP-13-11. HEATING. (a) General. The contractor shall furnish all labor, materials and equipment necessary for the installation in the Maintenance Building, of a two (2) pipe, low pressure, steam heating system, with mechanical return, and fully automatic gun type oil burner. Steam shall be generated at approximately five (5) pounds per square inch gage. Condensate shall be returned by gravity to a condensate return pump, and thence returned to the boiler.

(b) Boiler. The boiler shall be cast iron, of the rectangular, sectional type, designed for a steam working pressure of fifteen (15) pounds per square inch gage. The boiler shall be provided with the necessary connections for steam supply and condensate return, pressure gage and safety valve. The boiler shall be provided with a water column with gage glass, not less than two (2) compression

gage cocks, and water column and gage glass drain valve of the straight through type. The boiler shall be similar and equal to the water tube boiler, oil burning, size No. 250-7, rated for one thousand, nine hundred fifty (1,950) square feet of installed steam radiation, as manufactured by the H. B. Smith Co. The boiler shall be connected to the water supply as shown on the drawings. A three-quarter inch (3/4") brass blow-off cock shall be installed at the lowest point of the system and the boiler. The boiler shall be connected to the stack or flue by means of a smoke connection constructed of not lighter than #16 gage black iron, and of a size recommended by the boiler manufacturer. Suitable cleanout shall be provided which will permit cleaning of the smoke connection without dismantling.

(c) Oil Burning Equipment. The fuel oil burning equipment shall include the oil burner, motor, ignition equipment, controls, oil storage tanks, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic system. All fuel oil equipment shall be approved by the Underwriters Laboratories, Inc., and shall be installed in accordance with the latest standards of the National Board of Fire Underwriters for the installation of Oil Burner Equipment recommended by the National Fire Protection Association.

(1) Oil Burner. The oil burner shall be of the pressure atomization type, suitable for handling #2 fuel oil. The burner shall be quiet in operation and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall atomize the oil completely, and shall mix it effectively with the air so as to insure complete combustion. The air

admitted shall be of sufficient quantity for complete combustion, but not of such quantity to produce an undue percentage of excess air with the attendant high stack loss. The oil burner shall operate without clogging or failure and shall have sufficient capacity to develop not less than one hundred twenty five percent (125%) of the specified boiler capacity.

(2) Motor. The oil burner motor shall be of the open type provided with thermal overload protection and shall suit the current characteristics indicated on the drawings. Motor shall have sufficient capacity to operate the oil pump and fan in order to develop one hundred twenty five percent (125%) of the specified boiler capacity.

(3) Oil Fired Boiler Controls. The following controls shall be installed with the burner:

- a. Room Thermostat with a range of 40°F. to 90°F. to be located as shown on the drawings, five (5) feet above the floor in the shop, storage room and garage.
- b. Pressure limit control,
- c. Feed water regulator and low water cutoff,
- d. Stack switch,
- e. Automatic Draft Regulator, (Barometric type)
- f. Immersion Type Aquastat for summer and winter operation of domestic hot water system, and
- g. Any other controls required by the National Board of Fire Underwriters regulations or local regulations.

(d) Safety Valve. A suitable pop safety valve shall be installed

on the boiler and shall be set to open automatically and relieve steam at fifteen (15) pounds per square inch gage. The safety valve shall comply with the latest requirements of the A.S.M.E. Boiler, Construction code.

(e) Pressure Gages. Pressure gages of approved Bourden spring type shall be installed on the boiler and the low pressure steam supply line and condensate pump discharge line. All gages shall be installed in such a manner as to be accessible and easily read. Each gage shall have its dial set in an iron case having a baked enamel finish. Gages shall be equipped with either an integral or separate siphon, and shall be connected by means of brass pipe and fittings containing a shut-off cock.

(f) Domestic Hot Water System. A tankless hot water system for year round domestic supply, shall be furnished and installed. It shall be similar and equal to Taco-Abbot No. 14 system and have sufficient capacity to deliver four (4) gallons per minute of domestic hot water with one hundred degrees (100°) F temperature rise, when the water in the boiler is maintained at a minimum of one hundred eighty degrees (180°)F. For summer burner operation, the oil burner shall operate to maintain boiler water temperature as called for by an immersion aquastat.

(g) Unit Heaters. Unit heaters shall be installed in the shop, tool room and garage. They shall be similar and equal to Trane Model N, propeller type, with single speed controls and shall be installed with a manual control switch for summer operation as circulating fans, in addition to wall mounted thermostats for winter control.

(1) Float-and-Thermostatic Traps. Float-and-

thermostatic traps shall be designed for a steam working pressure of fifteen (15) pounds per square inch gage, but shall operate with a supply pressure of approximately five (5) pounds per square inch gage. The capacity of the traps shall be not less than two hundred (200) pounds of condensate per hour. The trap capacity shall be based on a pressure differential of three (3) pounds per square inch. Each float-and-thermostatic trap shall be provided with a hard bronze valvescat and mechanism, and a float of brass material, all of which can be easily removed for inspection or replacement without disturbing the piping connections. A suitable brass strainer, either as an integral or separate part of the trap shall be provided at the inlet to each trap.

(h) Radiators. Cast iron radiators of sizes shown on the drawings, shall be installed in the toilet, storage, and oil and paint storage rooms as shown on the drawings. Radiators shall be wall hung type, similar and equal to "Corto" as manufactured by the American Radiator Co. Radiator valves shall be similar and equal to Crane No. 227. Radiator traps shall be similar and equal to 8A, Hoffman thermostatic traps, angle pattern three quarters by three quarters ($3/4$ " x $3/4$ ").

(i) Condensate Pump and Receiver. A condensate pump and receiver shall be installed in the boiler room as shown on the drawings. Pump and receiver shall be similar and equal to Figure 3946 as manufactured by the Chicago Pump Co. Pump shall have sufficient capacity to handle condensate from two thousand (2,000) square feet

of direct radiation when discharging into boiler at a pressure of fifteen (15) pounds per square inch gage at the pump. The unit shall consist of one (1) centrifugal pump, direct connected to an electric motor, and one (1) receiver made of "Armco" rust resisting iron. Pump, motor and receiver shall be mounted on one (1) subbase. Motor shall be one third horsepower ($1/3$ HP, 120-volt, 60 cyle, A.C., single phase, operating at seventeen hundred fifty (1,750) r.p.m., and capable of operating continuously without undue heating, or sign of overload. Float switch in receiver shall automatically start and stop pump. Automatic starter for overload and low voltage protection for motor shall be furnished and installed.

(j) Piping. All pipe except returns buried under floor slab shall be black steel pipe with standard pattern cast iron fittings. Buried returns shall be wrought iron. Pipe shall be installed according to best practice and shall be located as shown on the drawings. Runs shall be parallel to buildings lines and all pipe passing through any masonry shall be set in sleeves cast in the masonry. Sleeves shall be two (2) pipe sizes larger than the system pipe. All pipes shall be supported not over ten (10) feet apart, with adjustable hangers or supports, with provision for expansion and contraction. Branches from mains shall be taken from top of mains at forty five degrees (45°) or ninety degrees (90°). All branches to radiators shall have swing connections. All pipe for cold water connections, and vent pipes from condensate receiving tanks, shall be standard weight galvanized steel. All fittings, not otherwise specified, shall be standard weight, uncoated, gray cast iron, designed for a working pressure of one hundred twenty-five (125) pounds per square inch.

Fittings for galvanized pipe shall be standard weight galvanized malleable iron, beaded pattern fittings, designed for one hundred fifty (150) pounds working pressure. Chromium plated floor plates shall be fitted to all pipes passing through floors. Buried returns shall be enclosed with six-inch (6") split vitrified clay pipe.

(k) Boiler Covering. The boiler shall be covered with eighty-five (85) percent magnesia blocks, at least one and one-half (1-1/2) inches thick, applied over one and one-half (1-1/2) inch mesh wire netting. The netting shall be held away from the boilers by metal spacers fastened to the wire. The finish coat shall contain a suitable amount of Portland cement and shall be troweled to a hard smooth surface. Cleanout and access doors shall not be insulated but the insulation shall be neatly beveled off at the edges of such openings.

(2) Pipe Covering. All heating system supply and return piping shall be insulated except as hereinafter specified. Heating system piping exposed within the heated portions of the buildings shall be left uncovered. All piping in boiler room and all concealed piping shall be covered with four (4) ply asbestos aircell one (1) inch thick, or approved equal. Asbestos aircell pipe covering shall have a thermal conductivity not in excess of fifty hundredths (0.50) Btu. per square foot per hour per degree Fahrenheit temperature difference at a mean temperature of one hundred (100) degrees Fahrenheit. All pipe covering shall be held in place with painted metal straps, not less than three-quarter (3/4) inch wide. The straps shall be spaced to hold the ends and center of each section but in no case shall the spacing be greater than

eighteen (18) inches. Straps shall be installed at each tee and two (2) straps at each elbow.

(1) Fuel oil Tank. A standard five hundred fifty (550) gallon fuel oil tank of welded steel construction shall be located and installed as shown on the drawing. The fill and vent lines and oil suction and return lines shall be genuine wrought iron pipe with malleable iron fittings. A two-inch (2") slip nipple fill box, similar and equal to Ohio Pattern Works and Foundry Co., No. 126 shall be installed as shown on the drawing. Foot valve shall be similar and equal to O.P.W. & F. Co. No. 92.

(m) Materials. All materials shall conform to Federal Specifications listed in paragraph TP-7-01(b) where applicable, or to the following list of basic Federal Specifications.

(1) Electrical Materials and Appliances. Electrical Materials and Appliances including motors shall meet the applicable requirements of Section 9.

(2) Firebrick. Federal Specification HH-B-671b, for "Brick; Fire-Clay."

(3) Fire Clay (For use with Firebrick). Federal Specification HH-C-4516, for "Clay; Fire Ground" Grade C.

(4) Iron and Steel Sheets. Federal Specification QQ-S-636, for "Steel; Carbon (Low Carbon), Sheets and Strips."

(5) Magnesia, Block, Cement, and Pipe Covering (Moulded). Federal Specification HH-M-61a, for "Magnesia; Block, Cement and Pipe-Covering (Moulded)."

(6) Metals, Inspection. Federal Specification QQ-M-151a, for "Metals; General Specification for Inspection Of."

(7) Nipples, Pipe, Steel and Wrought Iron. Federal Specification WW-N-351, for "Nipples, Pipe; Brass, Steel, and Wrought-Iron."

(8) Packing, Asbestos. Federal Specification HH-P-46a, for "Packing; Asbestos, Sheet, Compressed."

(9) Pipe-Fittings, Cast Iron (Threaded). Federal Specification WW-P-501b, for "Pipe-Fittings; Cast-Iron (Screwed), 125 - and 250-Pound".

(10) Pipe-Fittings, Malleable Iron. Federal Specification WW-P-521b, for "Pipe-Fittings; Malleable-Iron (Screwed), 150-Pound."

(11) Pipe, Steel, Seamless and Welded; Black and Zinc Coated. Federal Specification WW-P-406, for "Pipe; Steel and Ferrous-Alloy, (for ordinary uses)(Iron-Pipe-Size)."

(12) Pipe Threads. Federal Specification GGG-P-351a, for "Pipe-Threads; Taper (American - National)".

(13) Unions; Malleable-iron or Steel. Federal Specification WW-U-5311, for "Unions; Malleable-Iron or Steel, 250 Pound."

(14) Valves, Brass or Bronze; Angle and Globe 150-lb. Threaded. Federal Specification WW-V-51a, for "Valves, Bronze; Angle, Check and Globe, 125- and 150-Pound, Screwed and Flanged, (for Land Use)."

(15) Valves, Gate, 125 lb, Threaded. Federal Specification WW-V-58, for "Valves, Cast Iron Gate; 125-and 250-Pound, Screwed and Flanged (for Land Use)."

(16) Mechanical Equipment. All major items of

mechanical equipment shall be the latest standard catalog products of reputable manufacturers. Where two (2) or more items of the same kind of equipment are required, they shall be the product of a single manufacturer.

(n) Catalogues and Descriptive Data. Within thirty (30) days of the contract, the contractor shall submit to the Contracting Officer, for approval, catalogues and descriptive data of the materials and equipment the contractor proposes to use for the following:

- (1) Boiler and Fittings
- (2) Oil Burner
- (3) Oil Burner Controls
- (4) Condensate Pump
- (5) Radiators and Valves
- (6) Unit Heaters, Valves and F. & T. Traps
- (7) Tankless type water heater and all necessary fittings.

(o) Hydrostatic Test. The heating system shall be tested hydrostatically before insulation covering is applied, and shall be proved tight under a gage pressure forty (40) pounds per square inch.

(p) Cleaning of Steam Heating Systems. (1) The boiler shall be blown out under pressure, and after boiler has cooled it shall be partly filled and flushed out several times until all grease and impurities have been removed to the satisfaction of the Contracting Officer. The use of soda or any alkali, vinegar or any acid is not allowed. An insoluble compound recommended by the manufacturer of the boiler shall be used.

- (2) The interiors of all traps in the system shall

be removed and the system shall be operated for a period of three to five (3-5) days, as directed by the Contracting Officer. The condensate during this period shall be disconnected from pump and wasted to the nearest drain, or as directed by the Contracting Officer. This operation shall be executed under the supervision of a competent representative of the contractor.

(g) Operating Test. At the end of the cleaning period the trap interiors shall be installed and the returns connected to the pump. The system shall then be operated for a test period to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than six (6) hours for the system, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities and labor required to properly conduct tests shall be provided by the contractor, and all fuel, water and electricity required will be furnished by the Government.

TP-13-12. PLUMBING AND SEWAGE DISPOSAL SYSTEM. (a) Scope of Work. The contractor shall furnish and install the plumbing and sewage disposal system as shown on the drawing or specified herein, complete and ready for service, including all plumbing fixtures, supply, waste and vent piping, roof drainage, floor drainage, septic tank with influent and effluent piping and disposal drains. The contractor shall also install and make all necessary connections to a water pump and storage tank to be furnished by the Government and install connection from Maintenance Building to Equipment Building and to site of Operator's Quarters.

(b) Materials. All material shall conform to Federal Specifications listed in paragraph TP-7-01(b) where applicable.

(c) Plumbing Fixtures. The contractor shall install lavatory, urinal, and water closet similar and equal to products of Standard Sanitary Corp., as indicated on the drawing.

(1) Lavatory: Lucerne - F369 H, 20" x 18" wall hung with chain and stopper, three-eighths inch ($\frac{3}{8}$ ") supply pipes with stops and 1-1/4" P trap, all exposed metal, Chromard.

(2) Urinal: Alta - F 62400 with top spud, one inch (1") flush valve with vacuum breaker - Sloan Royal No. 180 YV or equal.

(3) Water Closet: Modernus - F-2186 with vitreous china tank, seat and cover No. 600.

(4) Shower: B 181 Mixing valve with metal handle and wall flange, gooseneck with Boyd ball joint head with volume regulator, $\frac{1}{2}$ " supplies, Chromard finish.

(5) Sink and tub in temporary Concrete and Soils Laboratory; Combination sink and tub of Alberene Soapstone or equal, regular grade, fifty-four inches by twenty-four inches (54" x 24") size without back, sink thirty (30) inches long. Both sink and tub shall be supplied with one-half inch ($\frac{1}{2}$ ") hot and cold water supply pipes with one-half inch ($\frac{1}{2}$ ") compression plain brass faucets similar to Walworth Fig. R 3722. Sink and tub to be fitted with one and one-half inch ($1\frac{1}{2}$ ") brass wastes connected to two inch (2") P trap.

(6) All fixtures shall be supported and connected in accordance with standard practice, the "Recommended Minimum Requirements for Plumbing", BH-13, U. S. Department of Commerce, and all local ordinances

(d) Piping Installation. (1) All piping shall be installed according to best practice and shall be laid out with proper fittings to make lines run parallel with building lines and close to walls and ceilings. Pipe supports shall be provided in sufficient number to prevent sagging of the pipe. Only supports approved by the Contracting Officer shall be used. Wall, floor and ceiling plates shall be furnished as called for in paragraph TP-12-17(d).

(2) Cast iron or wrought iron pipe sleeves of proper size to allow one-quarter inch (1/4") space shall be provided for all pipes passing through walls. Space between pipe and sleeve shall be packed with oakum to within one (1) inch of both faces of the wall and the remaining space filled with an asphalt mastic compound. All sleeves shall be cast in place as the masonry work progresses.

(e) Water Piping. All water pipe to plumbing fixtures shall be hard copper tubing conforming to Federal Specification WW-T-799a, for "Tubing; Copper, Seamless, (for Use with Soldered or Flared Fittings)", type L, with sweat fittings and shall be of sizes shown on drawing. All water lines above the ceiling shall be insulated. Piping to Equipment Building and for future connection in Operator's Residence shall be one inch (1") soft copper, Type "K". Connection to future residence shall extend to a point three (3) feet beyond the toe of slope and shall be suitably marked with a four inch by four inch (4" x 4") post six (6) foot long, set three (3) feet in the ground and painted white. Valves shall be all brass conforming to Federal Specification WW-V-54 for "Valves, Bronze, Gate; 125 and 150 Pounds, Screwed and Flanged (for Land Use)".

(f) Soil, Waste, Vent and Drain Piping. All soil, waste and drain pipe two inches (2") and larger shall be extra heavy cast iron soil pipe with soil pipe fittings of the same make and grade as the soil pipe. Waste pipe smaller than two inches (2") shall be schedule 40 genuine wrought iron, galvanized inside and outside, with standard, screwed cast iron drainage fittings. All vent pipes shall be galvanized steel pipe with standard screwed cast iron fittings. All joints between hub and spigot pipe and fittings shall be calked tight with picked oakum and pig lead. All calking lead shall be new, pure, soft virgin lead of the best quality, similar and equal to that processed by the National Lead Company. Joints between hub and spigot pipe and threaded pipe shall be made in the same manner as all cast iron joints except that the end of the threaded pipe shall have a cast iron conversion spigot screwed on the end and centered within the cast iron hub. After oakum has been compacted so as to leave a depth of not less than one inch (1") for the lead, the joint shall be filled with molten lead in one (1) continuous pour from the ladle and calked to form a neat and tight joint. Cast iron cleanouts shall be calked into hubs of fittings where shown on the drawing. Cleanout at toilet floor shall be brass, flush with finished floor.

(g) All changes in pipe size shall be made with reducing fittings. All changes in direction shall be made by the appropriate use of forty five (45) degree wyes, long sweep quarter bends, sixth eighth or sixteenth bends, except that sanitary tees may be used on vertical stacks, and short quarter bends or elbows may be used in soil and waste lines where the change in direction of flow is from the horizontal to the vertical, and on the discharge from the water closet.

Horizontal soil and waste pipes shall be given a grade of one quarter (1/4) inch per foot of pipe. A cleanout shall be installed at the foot of the vent stack and elsewhere as shown on the drawing. Cleanouts on hub and spigot pipe shall be a long sweep one quarter ($\frac{1}{4}$) bend. A standard weight cast iron ferrule with countersunk trap screw cover shall be calked into hub of fitting. Cleanouts on threaded pipe shall be cast iron drainage "T" pattern ninety (90) degree branch fitting with standard weight iron screw plugs of the same size as the pipe. Each fixture connected to the drainage system shall be equipped with a trap. The traps shall be installed as near to the fixture as practicable.

(h) Installation of Well Pump and Tank. At the cased well installed under Item No. 51 of the contract, the contractor shall install one (1) well pump with motor and accessories, and water storage tank, furnished by the Government for the water supply system, and shall make all necessary electrical and piping connections to put the system into operation. All work shall be done by mechanics skilled in their various trades and all work shall be accomplished in a workmanlike manner in the best modern practice.

(i). Septic Tank.

(1). A septic tank shall be installed in the location shown on the drawings. It shall be connected to the sanitary piping from the equipment building and shall have an effluent disposal system of four-inch (4") farm tile as shown on the drawing.

(2). The septic tank shall have a working capacity of seven hundred thirty-five (735) gallons and shall be similar and equal to Kaustine Super-Septic Tank No. 115 as manufactured by the Kaustine Company of Perry, N. Y. The intake line from building to angle point ahead of septic tank shall be four-inch (4") extra-heavy, cast iron soil pipe with Leadite joints or equal. Effluent line from septic tank to disposal drains shall be four-inch (4") salt-glazed vitrified clay pipe with double wye branches at disposal lines. Joints shall be calked with oakum and cemented. Disposal laterals shall be four-inch (4") round farm drainage tile, laid with open joints, spaced one-quarter ($1/4$) inch apart by galvanized tile connectors placed over top half of pipe. Laterals shall be placed in trenches filled with selected gravel conforming to the requirements of paragraph TP-5-08. Trenches shall be covered with six (6) inches of seeded topsoil.

(j). Tests. All water pipe shall be tight when tested with a hydrostatic pressure of one hundred (100) pounds per square inch. All soil, waste and vent piping shall be tight when filled with water to the top of the vent.

(k). Guarantee: The following equipment to be furnished under this section of the specification shall be guaranteed for a period of one (1) year from the date of final acceptance thereof against defective materials, design, and workmanship:

Septic Tank

Plumbing Fixtures

Boiler

Oil Burner & Motor

Oil Burner Controls

Water Heater

Lavatory

Water Closets

Shower Fixture

Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guarantee period the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor.

TP-13-13. ELECTRICAL.

All electrical work shall be furnished and installed in accordance with the provisions of Section 9.

TP-13-14. PAINTING.

Painting shall be done in accordance with the provisions of Section 14.

TP-13-15. PAYMENT.

(a). Payment will be made at the contract lump sum price for item No. 54, "Maintenance Building", for furnishing all labor and materials and performing all work necessary to construct the maintenance building as herein specified or shown on the drawings, including all excavation and back-fill for interior walls of foundations and setting Government-furnished equipment.

(b). Payment under Item No. 54 shall also include all cost of material, labor and equipment to install the sewage disposal system complete as specified or shown on the drawings except for trench excavation to be paid for under Item No. 6; backfill to be paid for under Item No. 16, and seeded topsoil under Item No. 48.

(c). Copper water line to Equipment Building and to provide future connection to Operator's Residence will be paid for under Item No. 31 and will include cost of post marker at end of line.

SECTION 14 - PAINTING

TP-14-01. SCOPE OF WORK.

The contractor shall furnish all materials and perform all work in connection with painting herein specified or as shown on the drawings or as directed by the Contracting Officer.

TP-14-02. MATERIALS.

Paints shall be well ground and shall show easy brushing properties and shall be of such composition that it can be easily broken up with a paddle to a smooth consistency. The paint shall neither settle badly nor cake in the containers. All paint shall provide a satisfactory film with a smooth even surface of hiding power satisfactory to the Contracting Officer. All materials shall be brought to the site of painting in the manufacturer's sealed packages with labels and tags intact. All paint and paint materials used shall, unless otherwise specified, conform to Federal Specifications as follows:

- (1) Blue-Lead Paint.- TT-P-20, for "Paint, Blue-Lead-Base; Basic-Sulfate, Linseed Oil, Ready-Mixed".
- (2) Exterior Primer - TT-P-25, for "Paint; Exterior-Primer, Ready-Mixed, White (Undercoat for Wood)".
- (3) Graphite Paint - TT-P-27, for "Paint; Graphite, Outside, Ready-Mixed, Black".
- (4) Metal Primer - TT-P-31a, for "Paint; Iron-Oxide, Ready-Mixed, Red and Brown".
- (5) Exterior Lead and Oil Paint - TT-P-40, for "Paint; Oil, Exterior, Ready-Mixed, Light-Tints and White", Type I, Class A or C as required.
- (6) Interior Linseed Oil Paint - TT-P-51a, for "Paints; Oil, Interior, Eggshell-Flat-Finish, Ready-Mixed, Light-Tints and White".

- (7) Plaster Primer - TT-P-56a, for "Paint; Primer-Sealer, (for) Plaster and Wallboard".
- (8) Red Lead Paint - TT-P-86, for "Paint; Red-Lead Base, Linseed-Oil, Ready-Mixed".
- (9) Drier - TT-D-651a, for "Drier; Paint, Liquid", either Type I or II.
- (10) Interior Gloss Enamel - TT-E-506a, for "Enamel; Interior, Gloss, Light-Tints and White".
- (11) Pigments-in-Oil - TT-P-381, for "Pigments-in-Oil; Paint-Colors".
- (12) Putty - TT-P-781a, for "Putty and Elastic Compound; (for) Metal Sash Glazing" and TT-P-791a, for "Putty; Pure-Linseed-Oil (for) Wood-Sash-Glazing".
- (13) Shellac - TT-S-271, for "Shellac; Orange".
- (14) Thinner - TT-T-291a, for "Thinner; Paint, Volatile Mineral Spirits (Petroleum-Spirits)".
- (15) Varnish, Asphalt - TT-V-51a, for "Varnish; Asphalt".
- (16) Varnish - TT-V-71a, for "Varnish; Interior".
- (17) Linseed, Oil - JJJ-O-331, for "Oil; Linseed, Boiled", and JJJ-O-336, for "Oil; Linseed, Raw".
- (18) Turpentine - LLL-T-791b, for "Turpentine; Gum Spirits and Wood (Steam Distilled and Sulphate), (for) Paint", and LLL-T-792a for "Turpentine; Wood (Destructively-Distilled) (for) Paint".
- (19) Machinery Enamel - similar and equal to Larax Machinery Enamel as manufactured by Pittsburgh Plate Glass Co.
- (20) Concrete Block Exterior - similar and equal to Medusa as manufactured by Medusa Portland Cement Co.
- (21) Metal Castings, etc. - bituminous base paint similar and equal to "Everjet" as manufactured by Barrett Chemical Div.

TP-14-03. SAMPLES, COLORS, AND APPROVAL.

(a) The contractor shall submit to the Contracting Officer for approval samples of each paint he proposes to use and shall obtain approval thereof before use of any of the material. The samples shall consist of three (3) displays of each color applied to wood or metal strips two inches by six inches (2" x 6") in size.

(b) The materials shall be subjected to tests required by the Contracting Officer. The methods of sampling, testing and analyzing shall be those used by the National Bureau of Standards, Washington, D. C. One (1) pint of each kind of paint material in unopened containers shall, if required, be submitted to the Contracting Officer for approval.

(c) The various colors to be used throughout the work shall be as selected by the Contracting Officer.

TP-14-04. PROCEDURE.

Before the first coat of paint or other coating is applied the contractor shall clean carefully the surface to be coated, remove all dirt, grease, rust, oil, scale and other foreign substances by the use of scrapers, wire brushes, sand blast, mineral spirits or other effective methods immediately before the application of paint. At no time shall any paint be applied to surfaces upon which there is moisture or frost nor during rainy or misty weather without suitable protection as approved by the Contracting Officer. Where painting is done during damp weather, the surfaces shall be heated to prevent moisture condensation thereon. While the painting is being done the

temperature of the air in contact with the paint surface shall be maintained at or above fifty degrees (50°) F. All paint when applied shall be at approximately the same temperature as the surface to which it is applied. No coat shall be applied until the preceding one is thoroughly dry, and there shall be at least forty-eight (48) hours between coats. All work shall be done in a neat, workmanlike manner leaving the surface free of sags, streaks, and runs. Drop cloths shall be furnished and laid over areas where necessary to protect floors, walls, equipment, etc. from damage during painting. All wood parts set in masonry shall be back primed. The contractor shall be responsible for the repair of any damage due to lack of precaution.

TP-14-05. SURFACES TO BE PAINTED.

(a) Equipment Building.-- The types of paint and number of coats thereof shall be applied as follows:

(1) Two (2) field coats of lead and oil paint over a shop coat of primer shall be applied on the following:

- a. Steel tubular and metal doors.
- b. Lintles (where exposed).
- c. Pipe Rails.
- d. Metal door frames.
- e. Hatch cover and frame.
- f. Manhole cover and frame.

(2) Two (2) field coats of asphalt varnish shall be applied to the following:

- a. Cleanout door and frame.
- b. Exposed piping (except in toilet room) and including oil pressure piping in passageway.
- c. Tank on oil pressure system.
- d. Miscellaneous metal items such as pipe hangers, fittings, brackets (except where adjacent metal is enamelled.)

(3) One (1) coat of wood primer, one (1) coat of enamel undercoater, and one (1) coat of enamel shall be applied to the following:

- a. Wood doors (interiors).
- b. Recorder Cabinet (outside and inside).
- c. Counter and shelves in storage closet.
- d. Toilet room wood, pipe and wallboard surfaces.

(4) The tin clad door shall be primed with metal primer and then given two (2) coats of linseed oil paint (interior).

(5) Exposed structural steel, monorail and steel sash (interiors) shall be given one (1) coat of enamel undercoater and two (2) coats of Machinery enamel. Undercoater shall be of type recommended by the manufacturer of the enamel. Surfaces of the above shall have been given shop coats of red lead, blue lead, or shall have been bonderized. Items not shop primed shall be given one (1) coat of red or blue lead prior to application of enamel undercoater and enamel.

(6) All exterior wood surfaces and exterior surfaces of wood doors shall be given one (1) coat of wood primer and two (2) coats of lead and oil paint.

(7) All exterior metal surfaces and steel sash shall be given one (1) coat of metal primer (if not shop primed) and two (2) coats of lead and oil paint.

(b) Maintenance Building.- The type of paint and the number of coats thereof shall be applied as follows:

(1) One (1) prime coat and two (2) coats of lead and oil paint shall be applied to all exterior wood work. The prime coat and one finish coat shall be applied as soon as practicable. The second finish coat shall be included in the final operations on the building.

(2) Two (2) coats of Medusa, made by the Medusa Portland Cement Co., or equal, shall be applied to all exterior exposed surfaces of concrete block. The paint shall be prepared and applied in a manner recommended by the manufacturer to provide a waterproof coating to the block.

(3) One (1) prime coat and two (2) coats of linseed oil paint (interior) shall be applied to all interior wood work, except in toilet rooms. The prime and first finish coat shall be applied as soon as practicable and the second finish coat shall be among the final operations on the building.

(4) All exposed piping shall be primed with metal primer and given two (2) coats of linseed oil paint (interior).

(5) All factory enamelled equipment shall have damaged surfaces touched up with same type of paint used in original painting. Equipment, where surfaces were damaged in excess of normal damage due to shipping and handling, shall be given one coat of machinery enamel. Unpainted equipment shall be given a prime coat (if not factory primed or hardenized), a coat of enamel undercoater of a type recommended by the manufacturer of the machinery enamel, or two (2) coats of machinery enamel.

(6) Two (2) coats of linseed oil paint (interior) shall be applied to all surfaces of Kalamein doors in addition to factory primer.

(7) Miscellaneous iron work in connection with equipment shall be enamelled in same manner as equipment. Miscellaneous iron work, other than in connection with equipment, shall be primed with red lead or blue lead and painted with two (2) coats of linseed oil paint (interior).

(c) Miscellaneous Surfaces.-

- (1) Sash runs shall be given two (2) coats of linseed oil.
- (2) All surfaces in toilet rooms specified to be painted shall be given one (1) coat of primer, one (1) coat of enamel undercoater and one (1) coat of enamel.
- (3) Highway guard posts shall be given one (1) coat of zinc sulphate and two (2) coats of lead and oil paint from the top of the post to the bottom cable and two (2) coats of a tar-base paint from the bottom cable to the ground.
- (4) Sluice gate bonnet covers and cylinders shall be given two (2) coats of Everjet.
- (5) Manhole ladder, manhole frames and covers and drop inlet cover shall be given two (2) coats of asphalt varnish.
- (6) Exterior handrails and adit door and frame shall be given two (2) coats of asphalt varnish.
- (7) The standby unit shall be given a coat of machinery enamel if the factory coat is damaged excessively and a touch up job would not, in the opinion of the Contracting Officer, be suitable.
- (8) All metal surfaces, exposed in the finished work, not specifically mentioned or adequately defined herein, shall be painted as directed by the Contracting Officer.
- (9) Metals embedded in concrete need not be painted.

TP-14-06. PAYMENT.

Separate payment will not be made for painting as such but payment shall be included in the contract prices for the items painted.

SECTION 15. LOG BOOM

(Item No. 52)

TP-15-01. SCOPE.- The work covered by this section includes the furnishing of all equipment and material and the performance of all work required to construct a log boom, as specified and indicated on the drawing.

TP-15-02. DESCRIPTION.- The log boom installation shall consist of a boom made up of wrought iron chain and logs. Each free end of the boom shall be attached to steel column sections of lengths and sizes indicated on the drawing and driven into the ground to the depths indicated on the drawing. The logs shall be joined by wrought iron chain and shall not be more than two (2) feet apart. Sufficient slack shall be provided in the length of the boom so that during low water the boom will float on the brook and lay on the banks; and during high water the entire boom will float on the surface of the water without any log being drawn below the surface of the water. No part of the boom shall at any time be suspended in the air. Two (2) logs of sizes indicated shall be installed at intermediate points, located approximately as indicated; the final location will be determined by the Contracting Officer. The contractor shall submit to the contracting officer, for approval, the length of the boom (connection to connection) he proposes to furnish.

TP-15-03. MATERIALS.- (a) Logs.-- Logs shall be of the following species and shall be stripped of bark:

Dense Southern Pine

Cedar

Chestnut

Douglas Fir

Oak

B.S.

Logs for the boom shall have a minimum diameter of ten inches (10") at the tip and shall be furnished in twenty foot (20') lengths. Logs shall be bored with two (2) one inch (1") holes at each end. Logs for the vertical posts shall be of the sizes indicated on the drawing. Logs shall be sound, straight, free from rot, and shall be approved by the contracting officer prior to use. The two steel piles on the banks shall be 10" H sections, 49# per foot. Steel shall conform to Fed. Spec. QQ-S-751a for "Steel; Structural (including Steel for Cold Flanging) and Steel, Rivet (for) Ships other than Naval Vessels; Structural Grade". Piles shall be primed with red lead and given a coat of approved black bridge paint prior to driving; after driving, the exposed portion of the piles shall be given a second coat of black bridge paint.

(b) Connections.- Strap connections shall be provided on each end of logs and shall be genuine wrought iron. Straps shall be bolted to each end of the logs by means of two (2) one inch (1") genuine wrought iron bolts, nuts and lock washers. Strap connections shall be fabricated from one half inch by two and one half inch ($\frac{1}{2}$ " x $2\frac{1}{2}$ ") stock. Provision for connection of chains to steel piles shall be made by welding wrought iron clips to the piles. Special shaped links shall be provided as required. The contractor shall submit shop drawings of the proposed connections. Factory made log boom units will be accepted subject to submission of satisfactory shop drawings and data.

(c) Chain.- Chain shall conform to Fed. Spec. RR-C-271, Grade I, Type A, Class 1, Close link, 1/2" size, long link, 205# per 100 feet of chain.

TP-15-04. INSTALLATION.- (a) The contractor shall construct the log

boom in the approximate location indicated on the drawings. The steel piles shall be driven in the location and to the depths indicated on the drawings. If an obstruction is encountered preventing the pile from being driven to the specified depth, the pile shall be pulled and re-driven without extra cost to the Government, in a new location to be approved by the contracting officer. In no case shall the pile be driven with the intent of breaking through any obstruction encountered except on the full responsibility of the contractor. Any pile so injured shall be replaced with a new pile by the contractor without extra cost to the Government. The contractor has the option of probing for obstructions prior to driving. Probing by jetting and jetting to facilitate driving of piles will not be permitted.

(b) The continuous boom constructed of logs and chains shall be placed across the river and secured to the piles as specified. Bolts shall be drawn up tight but not so as to injure the logs. Lock washers shall be provided under all nuts.

(c) The log posts shall be installed by driving or by excavating, or by a combination of both operations, at the option of the contractor. Posts shall be set plumb and after installation shall be rigid. Backfill shall be compacted by pneumatic hammers.

TP-15-05. PAYMENT.- Payment for furnishing all equipment and material and performing all work necessary to construct the log boom, including furnishing and driving steel piles and installing log posts, as specified, and indicated on the drawing, will be made at the contract lump sum price for Item No. 52, "Log Boom".